AUTOMOTIVE INDUSTRIES
THE AUTOMOBILE

Reg. U. S. Pat. Off.
Established 1902

Vol. 63 No. 3

NORMAN G. SHIDLE, Directing Editor

LESLIE PEAT, Managing Editor
P. M. HELDT, Engineering Editor
JOSEPH GESCHELIN, Asso. Eng. Editor
ATHEL F. DENHAM, Field Editor
HAROLD E. HILLMANN, Asst. Editor
HERBERT HOSKING, News Editor
HAROLD M. BAKER, Detroit News Rep.
A. B. CROFOOT, N. Y. News Rep.

Contents

Tariff Commission to Weigh Inequities. By Leslie Peat 73
Chrysler Eights Replace Imperial and "77". By Athel F. Denham 76
John A. C. Warner Named Secretary-Manager of S.A.E. 80
Formula of A.S.T.M. Fuel Curve Given 82
Rzeppa Universal Joint 83
Fliegner Formula Applied to Orifice Tests 85
Nash Inspection Saves Replacement Costs (Part Two) 86
AC Develops Intake Silencer 88
Just Among Ourselves. By Norman G. Shidle 89
Automatic Transmission Discussion. By P. M. Heldt 90
California Leads in State Gasoline Taxation 93
Argus Develops Inverted Four-Cylinder Aircraft Engine 94
Forum 97
New Developments 98
Automotive Oddities 100
News of the Industry 101
Men of the Industry 102
Advertisers' Index 100, 101

Automotive Industries is published every Saturday by

CHILTON CLASS JOURNAL COMPANY

Chestnut and 56th Streets, Philadelphia, Pa.

C. A. MUSSELMAN, President and General Manager
J. S. HILDRETH, Vice-Pres. and Director of Sales
W. I. RALPH, Vice-Pres. G. C. BUZBY, Vice-Pres.
A. H. VAUX, Secretary and Treasurer
JOHN A. CLEMENTS, Asst. Treasurer

JULIAN CHASE, Business Manager, Automotive Industries
GEO. D. ROBERTS, Advertising Manager

Cable Address ..... Autoland, Philadelphia
Telephone ..... Sherwood 1424

OFFICES

New York—U. P. C. Bldg., 239 W. 39th St., Phone Pennsylvania 0080
Chicago—5 South Wabash Ave., Phone Central 7045
Detroit—710 Stephenson Bldg., Phone Northway 2090
Cleveland—1140 Guardian Bldg., Phone Main 6860
Los Angeles—503 Petroleum Securities Bldg., Phone Westmore 9084

Controlled by United Business Publishers, Inc., 239 West 39th St., New York; ANDREW C. PEARSON, Chairman, Board of Directors; Fritz J. Frank, President; C. A. MUSSELMAN, Vice-President; F. C. STEVENS, Treasurer.

SUBSCRIPTION RATES: United States, Mexico, United States Possessions, Canada and all countries in Postal Union, $3.00 per year; Foreign, $6.00 per year. Single Copies 35c.

COPYRIGHT, 1930, CHILTON CLASS JOURNAL COMPANY

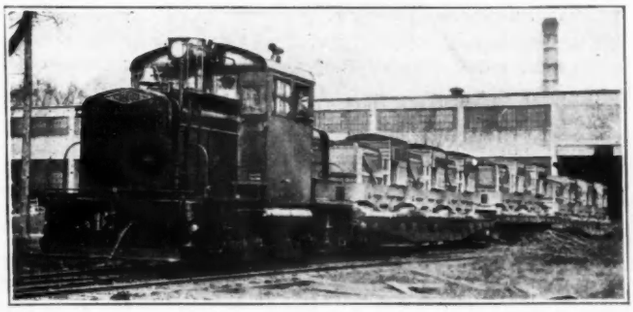
Member of the Audit Bureau of Circulations
Member Associated Business Papers, Inc.

Automotive Industries—The Automobile is a consolidation of the Automobile (monthly) and the Motor Review (weekly), May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

THE newest development in oil-electric locomotives—the 80-ton Whitcomb type O-8-O oil burning dual engine and generator locomotive, built for Chicago, Milwaukee, St. Paul and Pacific—is Young radiator equipped. Two special built radiators (2800 lbs. each) cool the 300 H.P. Waukesha engines. Radiator side members are of cast steel channel sections for utmost rigidity and strength. The core is made up in sections, permitting immediate replacement of a damaged section so operation may be continued without delay.

It is with pride we point out that Young engineering is identified with this new realm of industrial development. Whenever the unusual has been required, Young engineering, designing and manufacturing facilities have always proved successful, prompt and ample.

Fine quality radiators for busses, trucks, tractors, power units, and all types of cooling installations; backed by a guarantee of satisfaction.



Young Radiators

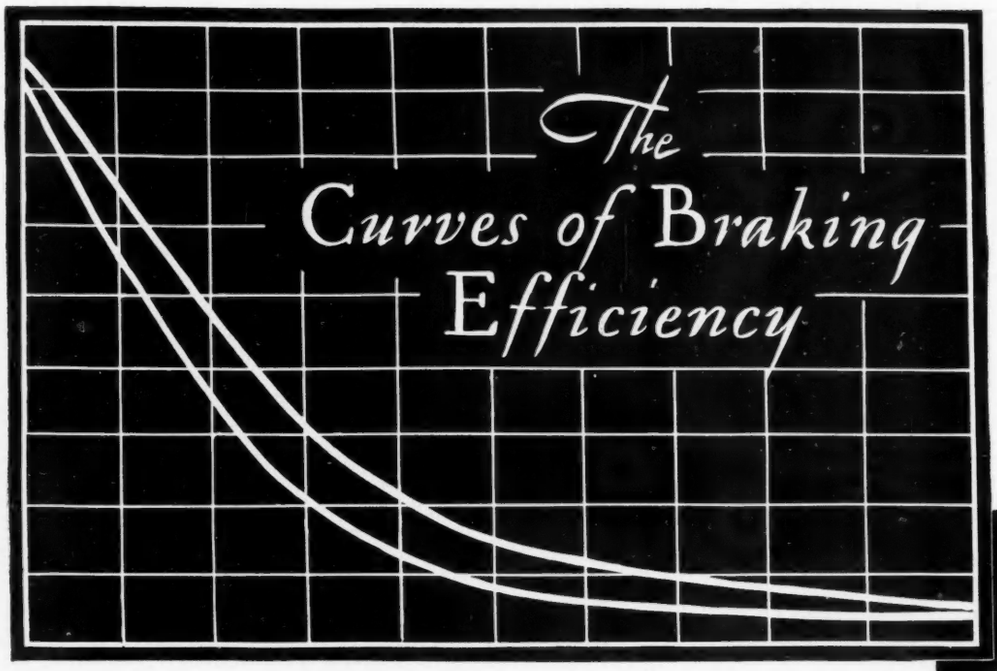
YOUNG RADIATOR COMPANY
Racine Wisconsin

Pacific Coast Representative
S. CLYDE KYLE
Rialto Building
San Francisco

Young Quality

Reg. U. S. Pat. Off. ©Y. R. Co.

YOUNG RADIATORS ARE USED WHERE THE GOING IS TOUGH



Better Braking

demands a friction material that is equally efficient on steel or cast iron drums

A poor brake material will breed contempt for the best brake ever designed. A good material, on the other hand, will help build public praise. Consequently, more and more automotive engineers are relying on American Brakebloks as the friction material most capable of bringing out the best qualities in the brakes they have designed.

American Brakebloks can be relied on to deliver maximum efficiency *either on steel or cast iron drums.* They show exactly the same type of curve for both kinds of metal.

Numerous tests also have proved that American Brakebloks can be relied on to deliver maximum efficiency under all conditions of weather, temperature, and braking pressures. *Their frictional characteristics remain unchanged throughout the entire life of the material.*

This unfailing dependability already has won for American Brakebloks a place on the production lines of more than 40 manufacturers of trucks and buses and the manufacturers of bus, truck and passenger car brakes. You, too, will find them worthy of your trust.

The Ten Commandments of the Braking Engineer

(1) Proper co-efficient of friction throughout entire life.
(2) Uniform deceleration.
(3) 100% recovery from effects of oil and water.
(4) Non-compressible under braking pressure.
(5) Non-abrasive, to avoid drum scoring.
(6) Will not vibrate (a dampener for squealing).
(7) Long life (will not burn, glaze, soften or wedge).
(8) Heat-resisting (will neither soften nor swell).
(9) Efficient on either steel or cast-iron drums.
(10) Uniformity of product.

Have you received your copy of "Braking Facts"—an interesting semi-technical discussion of braking problems? We'll gladly send you one upon receipt of your name and address.

AMERICAN BRAKE MATERIALS CORPORATION
Industrial and Automotive Division American Brake Shoe & Foundry Company
4660 Merritt Avenue • • • Detroit, Michigan, U. S. A.
Sales Offices: Chicago • • New York • • San Francisco
Export Department: 30 Water Street • • • New York City

American

BRAKEBLOKS

AUTOMOTIVE INDUSTRIES

VOLUME 63
NUMBER 3
JULY 19, 1930

Tariff Commission To Weigh Inequities

New group is empowered to set duty rates based upon study of production costs

President, Senate, House or "interested parties" may request Commission's survey

By Leslie Peat

Better understanding of the functions of the Tariff Commission of the flexible clause will disperse clouds of gloom

AUTOMOTIVE men interested in export business are looking with particular interest to the work of the Tariff Commission of six men, to be appointed by President Hoover under one of the provisions of the Hawley-Smoot tariff. Because this commission is actually empowered to raise or lower tariffs 50 per cent of the present schedules, with the approval of the President, and because the President has placed great faith in the success of the new tariff act upon this flexible clause for readjusting inequities, this group of three Republicans and three Democrats means much in international commercial and industrial thinking today.

The President, it is generally believed, will choose men for their understanding of the economics of tariffs. Their work will, then, be one which may result in the first economic approach to tariffs this country has known. These men will have six-year tenures instead of twelve, and will receive $11,000 instead of $9,000, the terms and annual salaries of commissioners under the 1922 tariff regime. The President has until 90 days from June 18, the day when the present act became law, to name his commission.

Instead of concentrating on one item until it has completed its report, the commission may act on several investigations simultaneously. This phase of the new law, it seems, will greatly increase the effectiveness of the rate-making body, which might conceivably become deadlocked on one item, temporarily ending its deliberations. Questions of readjusting the tariff on a

given item will be referred to the commission by the President, Senate, the House of Representatives or "any interested party."

The commission is empowered to actually set the rate, instead of simply making a recommendation, after investigating differences in the cost of producing any article in this country and abroad. This new recommended rate will then be sent to the President, who may veto it or proclaim the new rate a law and a part of the Tariff Act.

It is perhaps in the provision of the new act, whereby representatives of foreign countries may present their complaints to the commission at official hearings, that the automotive industry is mainly interested. They see in this the hope to preserve and add to general goodwill for the industry, created by constant study of European reactions to business methods and willingness of American manufacturers to adopt foreign trade practices in order to assure commercial friendliness.

No other government has invited other nations to avail themselves of a specially constituted body to pass upon their complaints of alleged tariff obstacles to trade, eliminating lengthy diplomatic circumlocutions customary in dealings between governments.

Briefly, the primary purpose of the flexible provision is to correct inequalities, incongruities and mistakes in the text of the new law. And in view of the extreme complexity of modern economic conditions and of the pressure of special interests and of sectional viewpoints upon the members of Congress, it would have been surprising if there had issued from the 22-month struggle a measure devoid of inequities and mistakes.

Many unsatisfactory phases are admittedly present in the text of the new law. The primary purpose of the flexible provision is to permit the new Tariff Commission to correct them.

Because industry and commerce are moving at such a high rate of speed and values are shifting so rapidly, neither a fiscal policy, nor a tariff policy, can prove widely, permanently satisfactory if it is afflicted with undue rigidity.

Representatives of foreign interests will be heard by the Commission to determine upon adjustments in the present tariff, under flexible clause

Balanced tariffs will encourage international goodwill and may promote increased volume of exports - - - -

U. S. Has Had Few Tariffs

The United States is probably the only major commercial nation which has adhered most persistently to the idea of a rigid tariff. Over the past 40 years we have had only seven new tariffs, or an average of one for about every six years. In contrast with that, practically all of our trade rivals have been shifting at frequent intervals this or that portion of its tariff structure to suit the new circumstances of consumers and of interested commercial enterprises.

A permanent scientific body working continuously and exclusively on this subject, in somewhat the way the Interstate Commerce Commission works on our railway rate structure, can, in collaboration with the President, make adjustments on individual commodities, as conditions change or need is proven—without introducing uncertainty into the entire business fabric, as do extended legislative deliberations which frame new measures.

It has been said that foreign countries cannot buy American goods if they are deprived of the means of payment which comes from merchandising their products in the United States. Opponents of the present tariff hold, therefore, that the prosperity of the United States might suffer, not only from this country's inability to sell its surplus output, but also because of the resultant inability to expand its producing capacity at a rate which would be possible if this were not the case.

The President, however, believes that the Hawley-

Smoot Tariff Act will not raise any such barrier against foreign merchandise. Changes from the Fordney-McCumber Act of 1922 were less drastic than appeared at first sight, and in the second place, he relies on the effectiveness of the flexible clause and the Tariff Commission to eliminate any barriers that may be raised from time to time.

Large Export Expansion

Under the Fordney-McCumber Act of eight years ago the United States took notable steps in expanding foreign trade, both in gross volume and in the increased number of foreign outlets for American-made goods. Of the 3295 items upon which duties were levied under this act, 2170 were unchanged under the provisions of the Hawley-Smoot tariff. These 890 items represent 27 per cent. On the other hand, decreased duties were made on 235 items, which partly offsets the effect of these increases. Because of this fact and also because of the large number of items remaining on the free list, it is estimated that the amount of duties collected on all imports will be considerably less than 20 per cent under the Fordney-McCumber schedules of 1922. This, of course, may be further reduced through the work of the Tariff Commission.

Regardless of retaliatory acts and duties imposed on American goods because of political and economic policies of foreign countries, the world is not yet in a position to ban American products, because the United States is the chief world source for automobiles and trucks, raw cotton, machinery, petroleum and steel.

Whatever effect the present tariff act may have in stimulating the foreign manufacturer of these items, it will be relatively small as compared with the stimulating effect of lowering prices of American goods through efficient production. Therefore, it would seem that the manufacturers of this country would have more to fear from the ever-growing production capacity abroad, and use of American production methods in factories abroad, than from the effect of the present tariff schedules.

The number of American manufacturers to establish foreign manufacturing and assembly plants abroad has increased rapidly during the past decade, and there is every likelihood of substantial increases in additions to this list in the next 12 months. Such programs as this encourage the adoption of American manufacturing methods and processes by foreign manufacturers. This will mean that domestic plants in this country must be increasingly alert to keep prices at the lowest possible ranges through increased production economies.

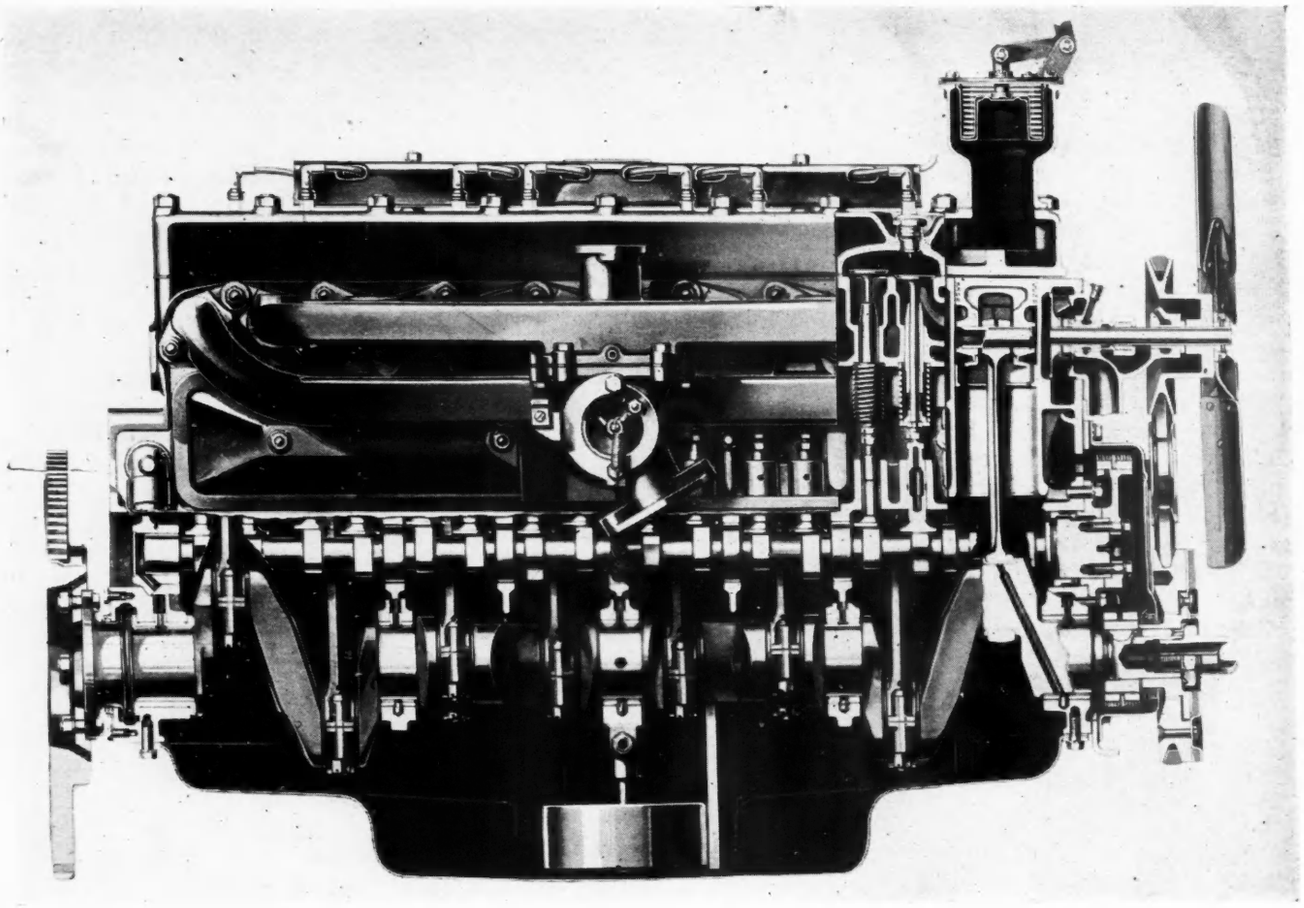
Automotive leaders seem to feel that now, with the tariff question settled, with the determination of the President to give the nation a sound, economic duty measure through the Tariff Commission, with our ability to produce at decreasing costs, there is nothing to fear in the outlook. Americans will still make automobiles, trucks and automotive products that will sell throughout the world, and the industry is sure that its percentage of the total American exports will be increasingly large.

	Date Enacted	Average Duty on all Imports Per cent	Average Imports Free of all Duty Per Cent
McKinley Tariff	1890	23.0	52.4
Wilson-Gorman Tariff	1894	20.9	49.4
Dingley Tariff	1897	25.8	45.2
Payne-Aldrich Tariff	1909	19.3	52.5
Underwood Tariff	1913	*6-14.8	*60-73
Fordney-McCumber Tariff	1922	13.8	63.8
Hawley-Smoot Tariff	1930	16.0	61-63

*Relative amounts disturbed by war conditions.

Average duty on all imports have decreased from 23 per cent to 16 per cent since 1890, while average imports free of all duty have increased from 52.4 per cent to 61-63 - - - -

Chrysler Eights in Striking Design Replace



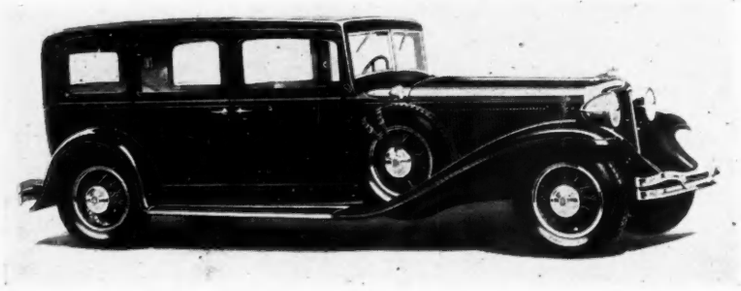
Longitudinal, sectioned view of Chrysler Eight engine, showing arrangement of thermostat for controlling radiator shutters - - - - - -

TWO eight-cylinder cars replace the former Chrysler 77 and the Imperial models of the Chrysler Motor Corp. Known as the Chrysler Eight and the Chrysler Imperial Eight, they are the first eight-cylinder cars to bear the Chrysler name. Although prices have not been definitely announced it is understood that the eight will sell in the $1,500 range, while the Imperial Eight will list around $2,500.

Contributing largely to the excellent performance of these new cars are the "multi-range" or four-speed transmissions which are continued from last year. Also carried over from the replaced models is the downdraft carburetion. On the Imperial Eight this takes the form of dual downdraft carburetor and manifold. The Chrysler Eight engine develops 80 hp. at 3400 r.p.m., the Imperial 125 hp. at 3200 r.p.m. The Eight Sedan weighs only 3500 lb., which accounts for the good performance with the moderate engine power.

Particularly striking in the new Chrys-

Chrysler Imperial Eight sedan-limousine for seven passengers



Imperial and "77"

Four-speed transmissions retained

Dual down-draft carburetor is used on Imperial Eight

Carburetor intake silencer reduces "engine roar" - - - -

By Athel F. Denham

The striking new front of the Chrysler Eights. Headlamp tie-bar is concealed behind the V-type shutters, which are deep enough to make a splash apron unnecessary - - - - - - - - -

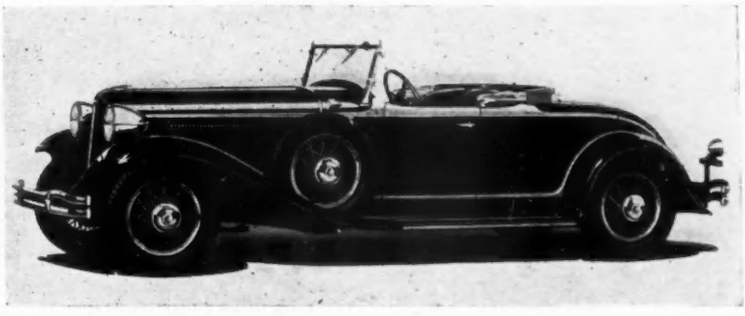
lers is the treatment of the front end. As will be noted from the illustrations, the radiator shutters are in the shape of a Vee extending well forward of the center-line of the front axle, while the shell is widened at the sides to add to the length of the hood and cowl. Moreover the automatic radiator shutter assembly is carried down considerably below the bottom line of the radiator core, so that it is unnecessary to provide a splash pan at this point. The deep radiator shell has made it possible to carry the headlamp tie-bar through between the core and the shell, concealing it effectively and leaving the front unbroken by horizontal lines.

Splash pans have below the front spring horns at the side been eliminated by stamping these in one unit, in an unbroken line with the inside apron of the one-piece fender. The gaps between the inside of the fender and the frame side rails have been eliminated by the use of sheet metal shields bolted to the frame side rails at their lower ends, and insulated by felt strips from the fenders at the upper edges, to prevent squeaks and rattles. Similarly the triangular opening between the shutters and the core, at the bottom, is sealed with a sheet metal plate bolted to the rear of the front cross-member, and to the shutter framing at the other two sides. None of these shields is visible except upon close inspection.

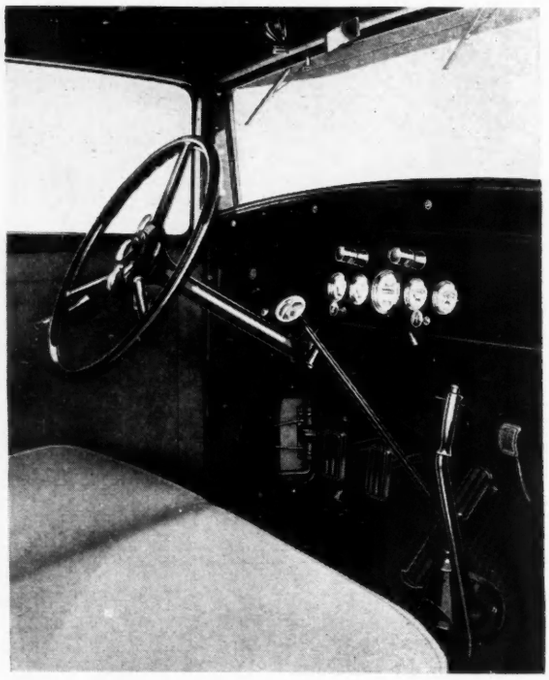
Further enhancing the frontal appearance of the new Chryslers is the unusually low gap between the fender and the hood. This is the result of using an unusually high kick-up at the front end of the frame, which also has the advantage of giving greater clearance for the front springs. Both the hood and the fender follow this kick-up.

From the cowl back the bodies of the Chrysler Eight are more interesting from a construction than from the appearance point of view. All-steel construction has been followed as far as possible, resulting in the elimination of body sills, etc. The new Chrysler Eight bodies for that matter represent probably the closest approach to all-steel construction that has yet been offered in cars of their price class. All-steel construction, of course, involves a higher die cost and has for that reason been confined chiefly to the lower-priced groups with high rates of production, in which die-cost is fairly rapidly absorbed. Imperial eight bodies continue of composite construction similar to that used on the previous Imperials.

There is plenty of evidence in the new Chrysler



Chrysler Eight roadster, three-quarter front, left-side view - -



Interior of front compartment of Chrysler Eight sedan. Dash and floor mats are heavily padded - - - -

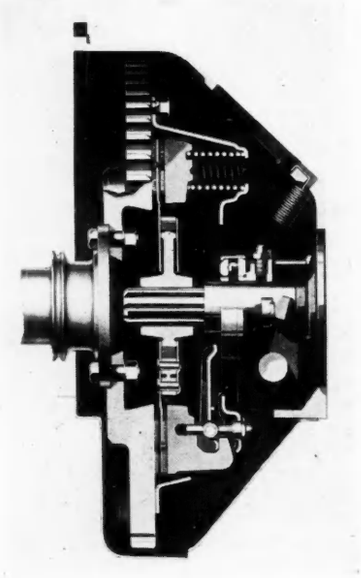
Eight that the body and frame have been designed as a single unit. Frame side rails follow the body closely, and side panels and running board splash shields are continuations of each other. Of the various body parts the side panels, roof panels, rear panels, and front end are welded into a single unit before assembly. This includes also the rear seat frame and bottom, and the framing for the front compartment toe and floorboards. Rear compartment floorboards, and front seat mounting and bottom, on the other hand, are bolted or mounted directly on the frame.

The idea of making the frame conform to the body design, rather than vice versa, as has been customary in the past, has worked out particularly well in both the new Chryslers, although it involved the development of new methods of frame bracing. Side rails are fairly close together at the front, of course. At the cowl they sweep outward with the body. Such a design would normally weaken a frame at this vital point. But in the Chrysler design, the front ends of the frame side rails are composed of a double channel, one inside the other. The inner of the two channels is

Chrysler Principal Specifications

	Eight	*Imperial*
Cylinder bore	3 in.	3½ in.
Piston stroke	4¼ in.	5 in.
Displacement	240 cu. in.	384 cu. in.
Compression ratio	5.2 (6.2)	5 (6)
Hp. and speed	80 at 3400	125 at 3200
Crankshaft dia.	2½ in.	2¾ in.
No. of main bearings	five	nine
No. of counterweights	none	eight
Impulse neutralizer	yes	yes
Piston material	al. alloy	al. alloy
Piston-ring type	Tungtite	Tungtite
Carburetor make and size	Stromberg 1⅜	Stromberg 1½ dual
Fuel feed	pump	pump
Electric system	Delco-Remy	Delco-Remy
Battery capacity	100 amp. hr.	153 amp. hr.
Temp. control	automatic shutters	automatic shutters
Temperature indicator	on dash	on dash
Engine lubrication	pressure	pressure
Type of clutch	single-plate	single-plate
No. of gear speeds	four	four
Rear axle ratio	4.1:1	3.818:1
Rear axle type	semi-floating	semi-floating
Four-wheel brakes	hydraulic	hydraulic
Brake size	12 by 1¾	15 by 1¾
Parking brake size	7 by 2	8 by 2
Steering gear type	worm and sector	cam and lever
Steering gear ratio	13.5 to 1	18 to 1
Front-spring size	35¾ by 2	39¼ by 2½
Rear spring size	54⅝ by 2	58½ by 2½
Type of shackle	rubber bushing	rubber bushing
Chassis lubrication	Zerk-Alemite	Zerk-Alemite
Overall length over bumpers	186 1/16 in.	210¾ in.
Tread at front	55⅞ in.	58½ in.
Tread at rear	58 in.	60 in.
Type of wheels	wood	wire
Tire size	5.50/18	7.00/18
Shock absorbers	2-way hydraulic	2-way hydraulic

Sectional view of the single-plate clutch -

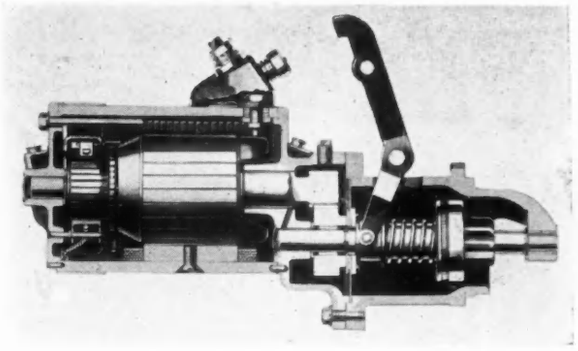


continued back in a straight line from the point where the frame sweeps outward with the body, and bolts with a heavy bracket to a full depth frame cross-member just back of the transmission. This results in a horizontally triangular bracing at both sides of the frame which looks as if it should add a good deal to frame rigidity.

Another point worthy of note in the frame is the provision of a frame cross-member passing under the powerplant just ahead of the rear rubber engine supports, making it unnecessary to rely on the rubber mountings for bracing the frame at this point. Spring shackles are attached to the frame side rails at point where cross-members are fastened to them, so that here also there will be a minimum of tendency toward frame distortion. Body brackets are provided both at the front and at the rear of the cowl and dash assembly to obtain maximum rigidity of assembly at the front end of the body.

To turn now to the mechanical units. Powerplants are fairly conventional in fundamental design. Valve arrangement is L-head with standard compression ratio of around five to one. Crankshafts are of the five-bearing type on the Chrysler and nine-bearing on the Imperial Eight, with bronze-backed, babbitt-lined bearing shells for both. Both engines have impulse neutralizers on the crankshaft, while the shaft for the Imperial Eight is also provided with eight counterweights. The impulse neutralizers, or torsional vibration dampers, are of the bonded-rubber-plate type recently adopted on cars produced by other divisions of the Chrysler Corp.

Most of the details of construction are obtainable from the accompanying table of specifications. In addition a number of minor items of design might be mentioned. These include the six-bladed fan, with the larger number of blades making possible a smaller diameter and therefore less noise; the new type thermostat located in the water outlet riser on the cylinder head, and thus controlling the opening and closing of the automatic shutters within a narrower temperature range; ribbing at the side of the crankcase for stiffening that unit; the unusually simple exhaust manifold and pipe installation made possible by the use of downdraft carburetion, and the use on the Chrysler Eight of an inclined accessories shaft, driving the oil pump and distributor.



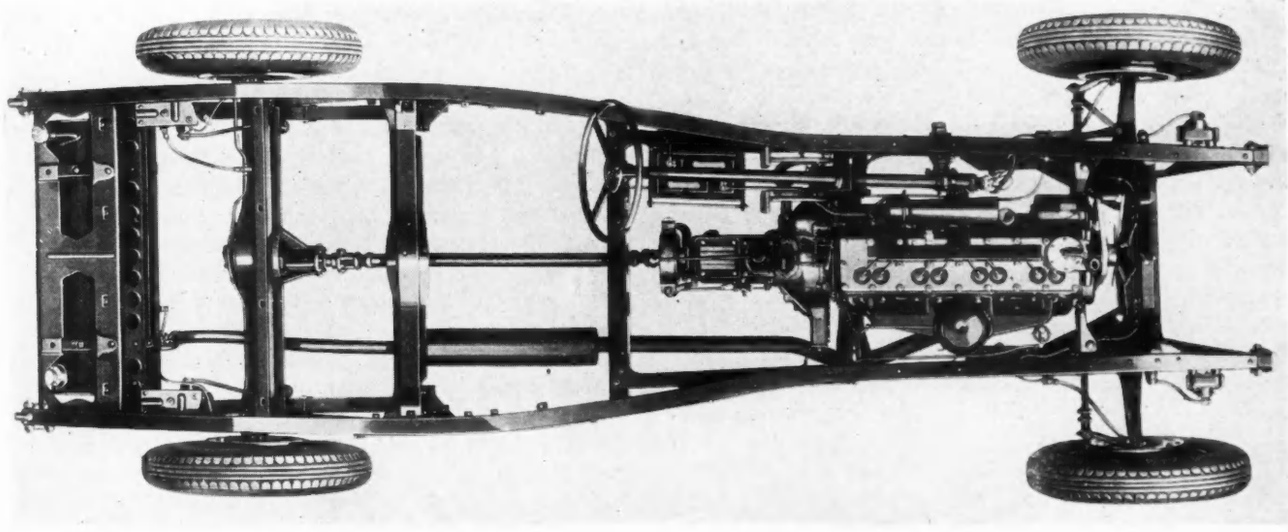
Electric starter with mechanical shift for starter pinion - - - - - - - - -

The Chrysler Imperial Eight is fitted with a carburetor intake silencer, a new development in the industry which has been specially engineered for this car. A detailed description of this device, with illustrations, appears elsewhere in this issue.

There is nothing of an experimental nature in the remainder of the chassis units. The four-speed transmissions with internal gears for the "quiet third" are developments from the units used in the larger Chrysler sixes last year. The same is true of the single plate clutches hydraulic brakes, and semi-floating rear axles. There is also little of fundamental difference of design between the corresponding units of the Chrysler Eight and the Imperial Eight. It is rather a

(*Continued on page 92*)

Plan view of Chrysler Eight chassis. Note that the frame side rails follow the contour of the body - - - - - - - - -



Councillors Name

Former staff member and committee head succeeds Coker F. Clarkson . . . .

John A. C. Warner

Secretary and general manager of the Society of Automotive Engineers

JOHN A. C. WARNER has been chosen secretary and general manager of the Society of Automotive Engineers, to fill the vacancy caused by the recent death of Coker Fifield Clarkson, and C. B. Veal, for four years research manager of the society and a former councillor, was appointed to the newly-created office of assistant general manager.

Mr. Warner resigned his position as assistant research engineer of the Studebaker Corp. of America, which organization he joined in 1926, to take up his work with the society on July 15.

For three years he served on the staff of the S.A.E. In 1923 he was appointed assistant research engineer and was later promoted research manager. In 1925 he became manager of the meetings and sections department of the society.

Upon graduating with honors from Worcester Polytechnic Institute in 1917, Mr. Warner joined the Bureau of Standards, where he worked on tests of materials used for airplane construction and instruments used in aeronautical navigation.

Serving in the A.E.F. in France during the World War, he did pioneering work on aircraft instrumentation, established the Orly laboratory at Orly Airport, and acted as contact engineer with the French officials and manufacturers, handling a large part of the purchase of aircraft equipment from European factories. He also conducted an aircraft instrument school for American officers. Following the Armistice he attended a course of aircraft and powerplant design at the Ecole superieure D'Aeronautique et de Construction Mechanique, Paris.

Mr. Warner participated in the first technical conference on aircraft matters to help decide terms of the Armistice, and advised on problems of international relations regarding adjustments having to do with aircraft. He joined the Bureau of Standards again and became executive officer of the Aeronautic Instrument Section.

In 1921 he served the government as technical representative on a special aircraft mission to Great Britain, France, Germany, Switzerland and Italy, and was appointed chief of the Aeronautic Instruments Section of the Bureau of Standards upon his return.

His association with the affairs of the society have been constant since his resignation from the S.A.E. staff. In 1927 he became a member of the meetings committee, riding qualities subcommittee and headlight subcommittee. He was appointed chairman of the meetings committee for 1928, 1929 and 1930, and continued his major part of his subcommittee work as well. In 1928 he served as a member of the joint committee of the I.E.S., and was a member of the S.A.E. steering committee.

At the recent Summer Session of the society he was nominated for vice-president to represent passenger car activity.

Among the technical papers he has presented, and which were later published, were:

Winter Tests Show Lower Mileage With Heavy Fuels (written in collaboration with Dr. H. C. Dickinson), presented at 1923 Summer Meeting and published in the *S. A. E. Journal*, July, 1923, and in 1923 Transactions (II).

Warner Secretary-Manager of S. A. E.

C. B. Veal, research manager, is appointed assistant manager, new society post

Winter Tests Show Greater Dilution With Heavy Fuels. Presented at 1924 Annual Meeting and published in the *S.A.E. Journal,* February, 1924, and in 1924 Transactions (I).

Riding Qualities Research, presented at 1924 Summer Meeting, and published in *S.A.E. Journal,* July, 1924, and 1924 Transactions (II).

Instruments for Automotive Research, presented at 1925 Annual Meeting, and published in *S.A.E. Journal,* April, 1925, and in 1925 Transactions (I).

Automotive Fuel Observations, presented before the Fifth Annual Meeting of the American Petroleum Institute, Fort Worth, Tex., Dec. 10, 1924.

Simplicity in Brake Design Best from Safety Standpoint, published in *Automotive Industries,* Dec. 8, 1928.

Mr. Veal graduated from Purdue University in 1902, with the bachelor of science degree in mechanical engineering. For 15 years, following his graduation, Mr. Veal was connected with Purdue University in various capacities. For the first two years he was assistant instructor in machine design and taught the design of internal-combustion engines. He developed the course in the design of gasoline automobile engines in 1903 and 1904, and was instructor in machine design from 1904 to 1907.

In 1905 he established the automobile testing plant at the university and for the next four years assisted in all automobile and automobile engine testing. From 1908 to 1910 he was assistant professor of machine design and administered the course in automobile and commercial truck design for the year 1910-1911.

He was appointed professor of machine design in charge of the machine design department and testing of automobiles, their engines and parts, including the heat-treatment of metals, in 1911 and remained there until 1917.

While at the university Mr. Veal was engaged in consulting engineering work, some of his clients being W. H. McIntyre Co.; McCormick Harvester Co.; Western Electric Co.; Rockwood Mfg. Co., Indianapolis; Peru Heating Co., Peru, Ind., and the Central Station Steam Co., Detroit.

From 1912 to 1917 he was the mechanical engineer for the Public Service Commission of Indiana and research engineer of the Indiana State Board of Accounts from 1915 to 1917. In 1916 Mr. Veal became associated with the Curtiss Aeroplane & Motor Corp., Buffalo, as assistant chief inspecting engineer, leaving in 1920 to become a member of the firm of Manly & Veal, consulting engineers, New York. In September, 1926, he became research manager of the society.

He has been an active member of the original research committee of the society from its formation and at various times served as member or chairman of the constitution, sections and other administrative committees. Mr. Veal has been a member of the grading committee for several years and for the last two years, the chairman.

For several years he has served on the Motor Truck Division of the Standards Committee and is now a member of the Operation and Maintenance Committee and representative of the society on the engineering division of the National Research Council, the Committee on Form and Arrangement of Specifications of the American Engineering Standards Committee and Division XII on Performance Tests of Rubber Products of Committee D-11 on Rubber Products of the American Society for Testing Materials.

He has been consecutively active on the committees of the Indiana, Buffalo and metropolitan sections.

C. B. Veal, who is promoted by S.A.E., becoming assistant general manager - -

Value of A.S.T.M. Fuel Curve is Given

Relation between standard distillation characteristics and engine performance at range of temperatures is demonstrated - - - - - -

AN extended investigation of the volatility of motor fuels has been made in the Department of Engineering Research, University of Michigan, with the aid of funds provided by the natural Gasoline Association of America, and a report on the investigation and conclusions drawn therefrom are given in Engineering Research Bulletin No. 14, The Volatility of Motor Fuels, by George Granger Brown.

A commendable feature of the bulletin is that it not only gives the results of experimental work but draws therefrom conclusions which can be directly applied to problems arising in connection with the every-day use of motor fuels. For instance, a formula is given for the maximum value of the 10 per cent point of the A.S.T.M. curve which will assure satisfactory starting of a cold engine, with the proper use of the choke, at any given low temperature (not so low, however, that the battery is incapable of cranking the engine for 5 to 10 revolutions). Another equation is given for the relation between the 35 per cent point of the distillation curve and the temperature of the mixture in the manifold at which operation of the choke is no longer required.

The major part of the "derived" results is embodied in two tables, one for modern passenger cars with an exhaust-heated manifold hot spot, a carburetor with an accelerating device and with radiator shutters; the other for cars not equipped with radiator shutters and supplying less heat to the inlet manifold or with a carburetor supplying only a limited accelerating charge.

The tables give the following data for four "average" atmospheric temperatures, of 80, 50, 20 and 10 deg. Fahr., viz.:

1. The lowest 10 per cent temperature consistent with easy starting of the cold engine and freedom from vapor lock with the hot engine.
2. The highest 10 per cent temperature which allows satisfactory starting and warming up under average conditions.
3. The minimum 35 per cent temperature which allows operation without choking ½ min. after starting.
4. The maximum 35 per cent temperature which allows operation without choking about 2 min. after starting.
5. The minimum 60 per cent temperature giving almost perfect performance without knocking about 4 min. after starting.
6. The maximum 60 per cent temperature giving perfect performance without choking from 8 to 10 min. after starting.
7. The minimum 90 per cent temperature not causing loss of acceleration with warm engine.
8. The maximum 90 per cent temperature now known to be entirely satisfactory under the indicated conditions.

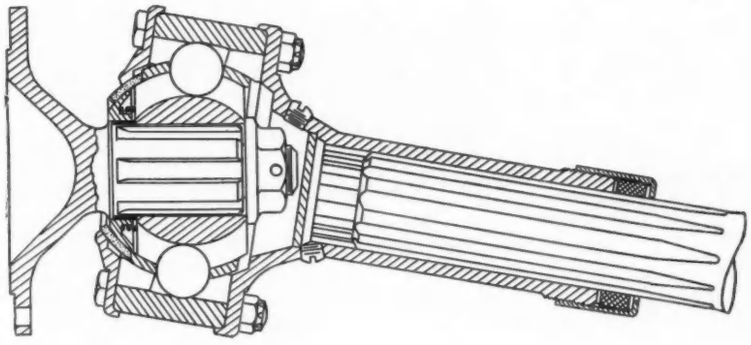
For a modern automobile engine equipped with exhaust-heated hot spot, with a carburetor with accelerating device and with radiator shutters these figures are given in the accompanying table.

The Relation Between A.S.T.M. Distillation Characteristics and Engine Performance at Different Atmospheric Temperatures

For a modern motor car equipped with exhaust-heated manifold hot spot, carburetor with accelerating device and radiator shutters

Points on A.S.T.M. Distillation With Loss Added at Lower End

	10%		35%		60%		90%	
Atmos. Temp.	Minimum	Maximum	½ Min.	2 Min.	4 Min.	8-10 Min.	Minimum	Maximum
	1	2	3	4	5	6	7	8
80°F.	140°F.	230°F.	235°F.	275°F.	275°F.	320°F.	390°F.	450°F.
50°	125°	190°	200°	250°	260°	310°	375°	420°
20°	110°	150°	175°	230°	235°	290°	350°	400°
—10°	90°	100°	125°	210°	180°	280°	320°	400°



The Rzeppa Universal Joint for rear drive cars has a flange, forged integral with the splined stub shaft, to facilitate dismounting of the propeller shaft - -

Rzeppa Universal Joint Has 40 Deg. Maximum Angularity

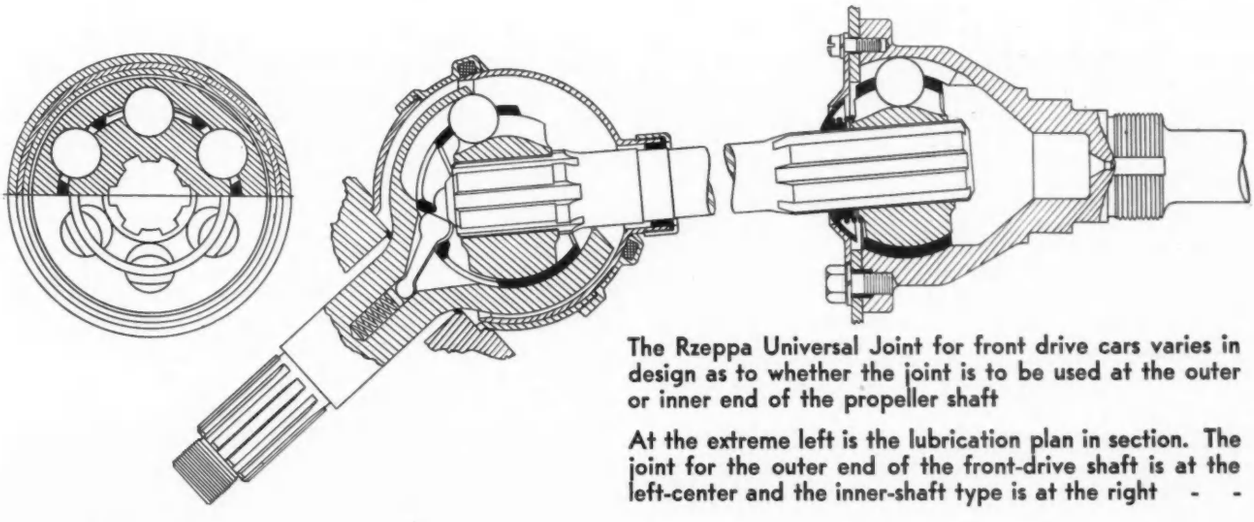
Unit is of the constant velocity type, and is being manufactured for both front and rear drive cars by the Gear Grinding Machine Co. of Detroit - -

A NEW constant velocity universal joint, known as the Rzeppa Universal Joint, has been developed, and is being manufactured by the Gear Grinding Machine Co. of Detroit.

The unit is of the type in which the transmission of motion is uniform regardless of the angle between shafts, hence it is particularly suited for use in front drives. One member is in the form of a spherical shell and the other in the form of a spherical segment, the latter being located within the former and concentric with it. The shell is provided with ball grooves in its interior, and the segment with ball grooves in its exterior surface, and steel balls placed in these grooves lock the two members in driving relation. There are six pairs of ball grooves and six balls. The centers of the balls are held in a plane by means of a ball cage in the form of a spherical shell with slots in it in which the balls are located.

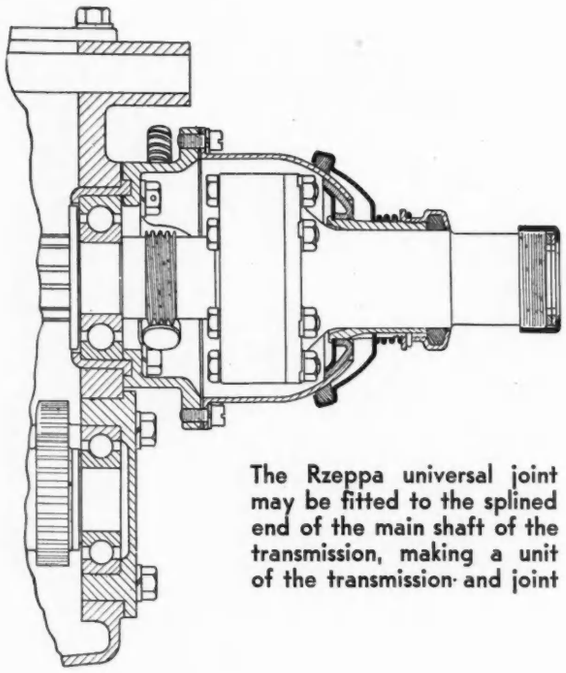
When the axes of the two connected shafts make an angle with each other, the plane through the centers of the balls bisects the angle formed by these axes. This relationship is maintained automatically by the balls themselves. For steering joints this is assisted by a pilot lever, which has ball and socket connections with both shafts and a ball and socket fulcrum in the cage. It is generally understood that the transmission of motion is uniform, when the driving and driven members are connected by a series of balls in such a way that the plane of the ball centers bisects the angle between the axes of the connected shafts.

The design of the joints for front drives varies according to whether the joint is to be used at the outer or the inner end. The accompanying drawings



The Rzeppa Universal Joint for front drive cars varies in design as to whether the joint is to be used at the outer or inner end of the propeller shaft

At the extreme left is the lubrication plan in section. The joint for the outer end of the front-drive shaft is at the left-center and the inner-shaft type is at the right - -



The Rzeppa universal joint may be fitted to the splined end of the main shaft of the transmission, making a unit of the transmission and joint

show sectional views of both types. In the case of the joint for the outer end the shell is the driven member and is formed integral with the driving spindle which is clutched to the front-wheel hub. The driving member is internally splined and is forced over the splined end of the driving shaft, against a collar thereon.

In the joint for the inner end of front-end propeller shafts the functions of the two parts are reversed, the shell being the driving and the spherical segment the driven member, the latter sliding on the splined end of the propeller shaft to compensate for variations in length between the centers of the universal joints due to spring action.

These joints are arranged for oil lubrication, and two types of covers are illustrated. The one shown at the left consists of three parts, all segments of spherical shells, of which one is supported on the driving shaft by a bushing, the second is set into a recess on the wheel hub, and the third is screwed over the second and is provided with a groove adapted to take packing to insure an oil-tight sliding joint. In the design shown at the right there is no cover completely inclosing the universal joint. The shell-shaped driving member also serves as oil retainer, and the opening in same, through which the driven member and cage are introduced, is closed by a plate with a spherical surface formed on it and a collar with spherical surface riding on the driven shaft. The two spherical surfaces are pressed in contact by a coiled spring.

A feature of this universal joint is that it can be worked at angles up to 40 deg., which is desirable when it is to be used at the outer end of front-drive propeller shafts. The ball grooves in the driving and driven members are finish-ground to permit close fits of the balls in all positions.

The main members may be assembled by inserting them into each other angularly and turning them into proper position, which is possible because of their spherical shapes and the definite relation existing between the projecting and receding portions of the inner member, the cage and the outer member.

Lastly the balls are assembled and all parts are locked into a self-contained unit.

For use in rear-drive propeller shafts the universal may be designed somewhat differently, as shown in one of the drawings. For such applications the use of a companion flange facilitates dismounting of the propeller shaft. The companion flange in this case is forged integral with a splined stub shaft on which the ball driving member is mounted. The driven member in this case consists of three parts, a flanged hub or sleeve internally splined, a ring in which the grooves for the balls are formed, and another flange, the three parts being held together by bolts. Lubricant is retained by means similar to those employed in the joint for the inner end of front-drive propeller shafts.

To save overall length as well as to eliminate chances of misalignment and resultant vibration, this joint may be fitted to the splined end of the main shaft of the transmission, thus making a unit of the transmission and the universal, as shown in the drawing. Lubrication then is by splash, the oil entering from the gearbox through the main shaft bearing and returning through a drain which is located at the bottom of a non-revolving oil-tight cover, which latter is similar in construction to the one described in connection with the front-drive wheel joint.

This joint is being made in shaft sizes of 1¼ and 1½ in. for passenger cars and 1¾ to 2½ in for heavy traction vehicles.

Systems of Wage Payment

INCENTIVE systems of wage payment, such as piece rate wages, special bonuses and other methods of compensating employees according to output, where applicable, generally result in increased production, higher earnings for labor and lower production costs, according to a study entitled "Systems of Wage Payment," just completed by the National Industrial Conference Board, New York. The study makes it clear that incentive wage systems cannot be indiscriminately applied to all types of work.

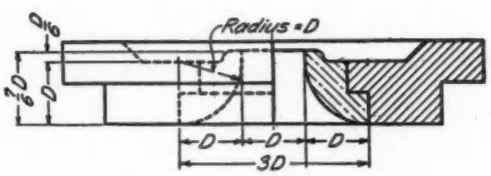
The advantages derived from incentive wage systems, the Conference Board finds, result in part from the increased efforts which such systems stimulate the worker to put forth in order to increase his earnings, and partly from the effect of such incentives in attracting workers of more than ordinary ability.

Lincoln Spring Test

AN interesting test of the Lincoln automobile spring has been developed at the Detroit plant. The springs are first tested to sustain a load of 1200 lb. at a predetermined measure of deflection and then are literally pushed inside out under a heavier load. They are then released and pushed down again under another load of 1200 lb. and must again come to the same measure of deflection.

Constants for Air Orifices Checked

Drop in pressure of air on flowing through circular orifice with rounded approach is used to determine rate of flow - - - -



Form of orifice used in the investigation - - - -

AN investigation on the flow of air through circular orifices with rounded approach has been made at the Engineering Experiment Station of the University of Illinois, Urbana, by Joseph A. Polson, Joseph G. Lowther and Benjamin J. Wilson, and is reported in Bulletin No. 207 of the Station. There has been much work done on rates of air flow through orifices in the past, and the specific purpose of this investigation was to determine, by a precision method, the coefficients to be applied to Fliegner's formula for the flow of air. The method consists in weighing the air discharged per unit of time while controlling the pressure on the inlet side of the orifice.

Fliegner's formula is as follows:

$$M = 63.6 \frac{a}{\sqrt{T_1}} \sqrt{P_2 (P_1 - P_2)}$$

where M is the amount of air discharged, in lb. per minute;

a, area of the smallest section of the orifice, in sq. in.

P_1, absolute pressure of the air at the entrance to the orifice, in lb. per sq. in.

P_2, absolute pressure of the air on the outlet side of the orifice.

T_1, absolute temperature of the air on the entrance side of the orifice, deg. F.

The following conclusions were arrived at:

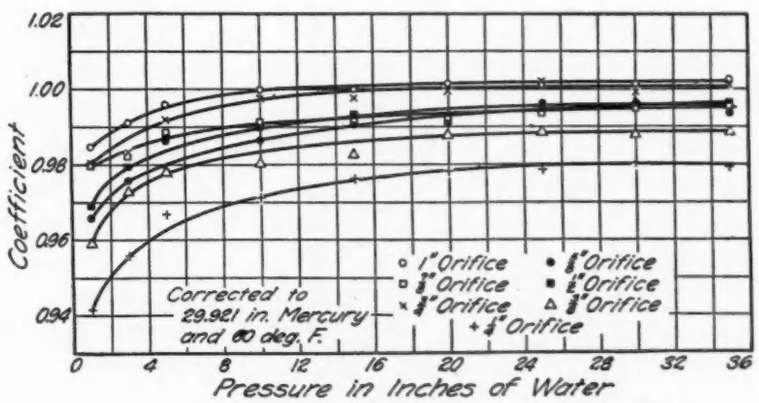
First—The weight of air discharged through orifices with rounded approach agrees very well with that calculated by the use of Fliegner's formula for the range of inlet pressures used in this investigation, namely, 1 in. of water to 35 in. of mercury.

Second—The coefficients as applied to Fliegner's formula show a more rapid change for low pressures on the inlet side of the orifice and for small orifices. As the inlet pressure is increased and as the orifice diameter is increased, the value of the coefficient tends to become more nearly uniform. Due to the rapid change in the value of the coefficient at low heads, interpolation cannot be made as definite as at the higher heads, where the value of the coefficient is more nearly constant. It is, therefore, not advisable to use this type of orifice for pressures on the inlet side of the orifice less than 10 in. of water, unless the orifice is carefully calibrated for the required condition. The change in the value of the coefficients is slight for inlet pressures above 10 in. of water for pressures up to 35 in. of mercury, the limit of this investigation.

Third—It is advisable to use water or oil as the manometer liquid for all pressures within the limit of the manometer. For the higher pressures mercury should be used. However, mercury should not be used in glass tubes of less than ⅜-in. inside diameter. Capillary tubes of 2 to 3 millimeters inside diameter are likely to introduce considerable lag in movement both up and down.

Fourth—The use of Fliegner's formula with a coefficient of unity for inlet pressures between 1 in. of water and 35 in. of mercury may introduce errors ranging from 6.2 per cent too high to 0.5 per cent too low.

Fifth—The type of orifice used is not difficult to produce, and the results of test on duplicate orifices agree closely.



Coefficients to be applied to Fliegner's formula for various size orifices and various pressure drops - - - - - - - - -

Nash Uses Ingenious Inspection Plan

By Athel F.

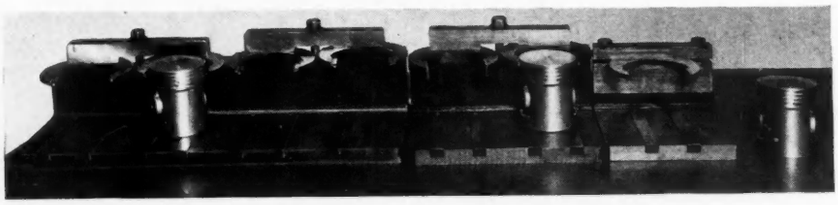


Fig. 1—Nash installation for checking piston ring grooves and lands

AN excellent example of the ingenuity used by the Nash inspection department is found in the piston line. In addition to the customary inspections during the machining process, pistons require especially careful checking after finish-machining. Fig. 1 shows an installation for 100 per cent checking of grooves and lands.

Checking these parts is customarily done by hand and is thus subject to some extent to the human element in properly handling the pistons. At Nash, go-no-go snap gages are mounted on blocks at fixed height (distance above skirt end, plus .010 in.). The piston is slid into the snap gage on ground ways, the gages being tapered at the forward ends so that the piston will not strike an edge of the gage.

The snap gages for checking the outside diameters of the lands are mounted in such a manner that when turned over, or reversed, the parts of the gage formerly checking the lands are then opposite the grooves, and vice versa, thus increasing the effective life of the gages.

Although not a part of inspection operations, the installation for assembling rings on the pistons (Fig. 2) should well be included here. There are four arbors on each of which one type of ring is mounted. The arbors are tapered outward at the top. To assemble rings on the piston, the latter is placed head down on the first arbor, and since the top of this unit is so designed that the piston head is somewhat inside the rings, the ring will slip off into the correct groove, at the top in the photo, nearest the pin boss.

The piston in then placed on the second arbor and a ring is "kicked" off into the next groove, similarly for the third and fourth ring. The entire operation is performed considerably more rapidly than it can be described. Pedals are connected to the arbors by ratchet rack and gear arrangements, so that each time the pedal is depressed, the arbor is pulled down the width of one ring.

An interesting inspection fixture is that shown in Fig. 3 for checking the squareness of the pin hole with the piston. As will be noted, there are no levers in the device, making for maximum accuracy. The piston

Fig. 2—Assembling rings on pistons (left), at Nash is done on a special device, which "kicks" ring in position

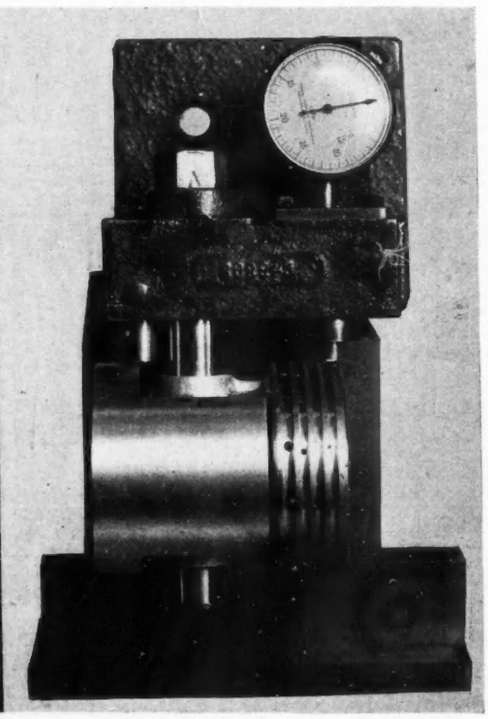


Fig. 3—Fixture for checking squareness of the pin hole with the piston skirt (right), with errors shown at double magnitude on the dial

Along Piston Line

Universal fixture devised to check piston and rod assemblies, described in Second of Series of Articles

Denham

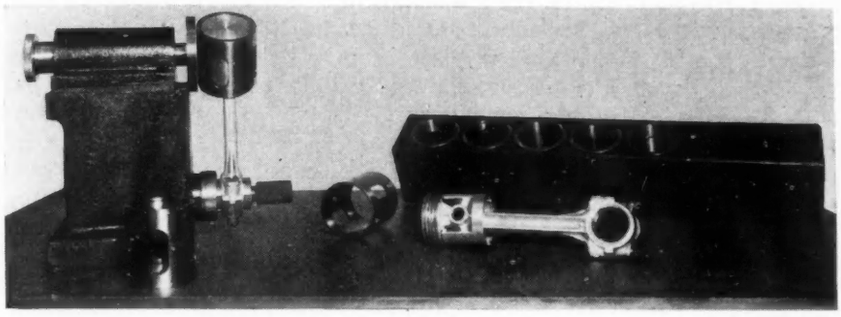


Fig. 4—Universal fixture which is used at Nash for checking piston and rod assemblies, as well as inspecting parallelism of piston pin and crankpin bores - - - - -

is slipped onto the plug arbor, brought up against the fixed stop at the left, on the skirt, and the reading on the dial gage observed by the inspector.

The piston is then reversed and if the second reading coincides with the first the center line of the pin hole is then at exactly right angle with the center line of the piston. This method of checking is more accurate for the reason that no compound levers or equalizers are used and an error is shown double its magnitude on the dial indicator.

One of the most interesting inspection devices we have seen for some time is the universal fixture shown in Fig. 4 for checking piston and rod assemblies. The fixture consists of an arbor on which the crankpin end of the connecting rod is slipped, a set of master sleeves representing standard cylinder bores including various sizes to cover the range of production tolerances, and a second arbor mounted in a close-fitting bearing and equipped with a disk accurately ground for squareness.

The crankpin arbor is not of the usual expanding type, but has a single "expander" in the lower side, which draws the top of the connecting rod bearing down against the arbor, to imitate the normal running condition in an engine. The sleeves are beveled at the bottom so that they can be slipped over the complete piston with rings, and have a step machined inside to correspond with the diameter of the top land, to assure a bearing of the sleeve at the top as well as on the skirt of the piston.

The actual checking is merely by observing whether any light can be seen between the sleeve and the disk, the latter being brought up into contact with the sleeve by hand. In addition to serving as a check for squareness of the assembly the fixture also serves as an inspection device under the same conditions, for parallelism of the piston pin and crankpin bores in the connecting rod. If these bores are not parallel, rocking the piston on its pin produces an out-of-square condition, and allows light to show through at the top or bottom of the juncture between the sleeve and the disk, which is easily observed by the inspector. It may be well to mention here that the last operation on Nash connecting rods is the diamond boring of the upper and lower bearing in one operation. The alignment of the bearings, therefore, is exact, and no straightening of rods is necessary. This is of particular interest, as it is well known that in straightening a connecting rod internal metal strain is set up at the point of bending. The strain represents a defect which, while the rod is in service, has a tendency to again cause misalignment.

A Prestwich fluid gage checks piston pins to within one-half of a ten-thousandth of an inch.

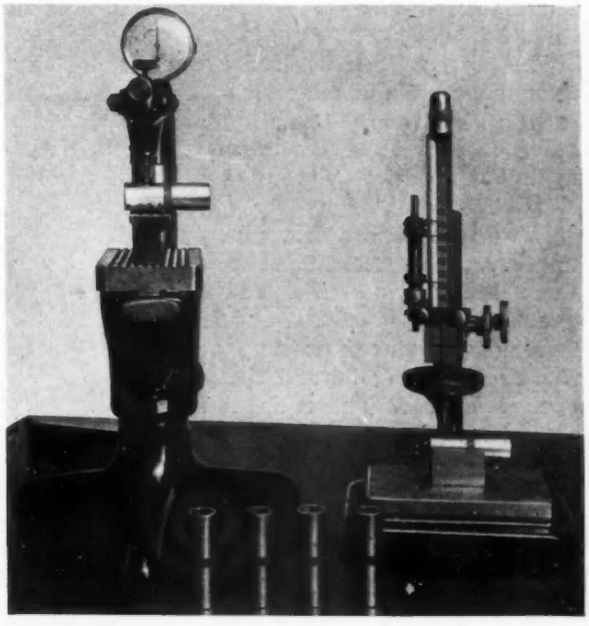


Fig. 5—The Prestwich fluid gage checks piston pins to 0.00005 in. - - - -

AC Develops Intake Silencer Device

Elimination of "power roar" claimed for muffler being used on Chrysler and other new models to be announced this month. Breaks up air vibration - - - - - - -

THE desire for silence in automobile operation has brought about many developments in the past few years. Not the least of these is represented by the "intake silencer" which is making its appearance on a number of new cars this month. One of the most interesting devices along this line has been worked out by a number of manufacturers in collaboration with the AC Spark Plug Co. The device is simple and inexpensive, and it takes up only little more room than the average air cleaner.

The purpose of an intake silencer is to prevent "power roar." The latter, of course, has been present in all cars in the past, but it has become the more noticeable recently because of constant advance in quieting engines in other respects and of the widespread adoption of eight-cylinder engines.

It has been found that power roar, that is, engine roar when operating under heavy load, is nothing more than rapid vibration of the column of air in the intake system. When the frequency of this vibration reaches the audible range—which it naturally does at a lower engine speed in an eight than in a six or four-cylinder—the intake manifold acts like an organ pipe, the sound passing back through the manifold and out at the air intake.

The problem then resolved itself into breaking up this air vibration or decreasing its intensity. The AC silencer does this at the air intake, its action being based on a well-known phenomenon applied in aerodynamic research in various ways—that of the resonator.

If we take an ordinary pipe and set up therein air vibrations of a given wave length, and then add another closed-end pipe of one-quarter that wave length, we can prevent the vibration from getting beyond the junction of the two pipes. This is due to the fact that the vibrations will travel up the added pipe, be reflected and reach the junction point exactly one-half wave length out of phase with the original vibration. The original and the reflected vibration thus will neutralize each other.

The vibrations in a manifold, however, are of considerable wave length up to 10 ft. This would require a resonator pipe 2½ ft. in length, which would be out of question for most designs. It is possible, however, to obtain practically the same result by replacing the resonator pipe by a bottle-shaped chamber (*C* in figure) much smaller in size but having the same vibrating capacity as the pipe it replaces.

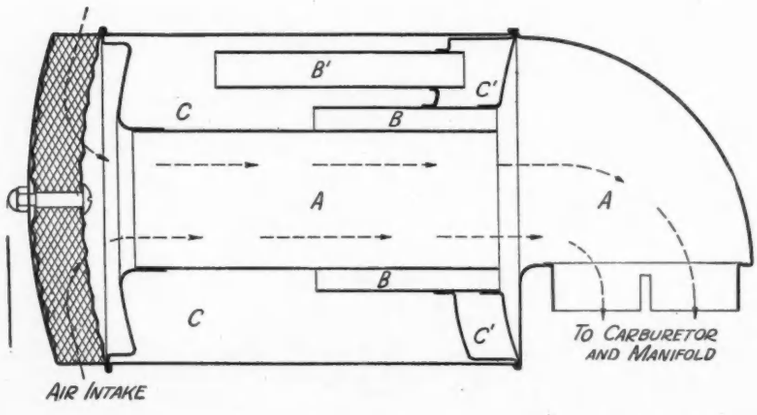
This is what has been done in the AC intake silencer. It must be understood, of course, that a device of this kind must be specially developed for each type of engine to which it is to be fitted.

Below is shown this intake silencer as developed for the Chrysler Imperial Eight. In this the original pipe, referred to in the foregoing explanation of the principle involved, is represented by the air intake passage marked *A*. Around this there is another pipe *B* open toward the manifold and opening into a chamber *C*, *B* and *C* together forming the bottle resonator.

Experiments showed that—as might have been expected—the air vibrations in the manifold were of more than one frequency, the second frequency probably being a multiple or harmonic of the fundamental, but of lesser amplitude. To take care of the vibration of the next most important wave length, another bottle resonator is added inside the first one. This second pipe and its chamber are shown at *B'* and *C'* respectively.

Thus vibrations of one wave length will set up a corresponding vibration in chamber *C* and pipe *B*, and those of a second wave length will correspond to the natural period of vibration of *C* and *B* plus chamber and pipe *B'* and *C'*.

The chief advantage of this method of silencing the air intake is that it does not restrict the air flow into the manifold. It is another example of applications of laboratory and purely scientific research to practical uses in the industry.



AC intake silencer as developed for the Chrysler Imperial Eight

JUST AMONG OURSELVES

Good Roads—Maker of Goodwill

AT a time when international goodwill is so closely allied to the future of American export success, the Sixth International Road Congress, scheduled to be held in Washington, Oct. 6-11, takes on a special significance.

Roy D. Chapin, former president of the National Automobile Chamber of Commerce and long an outstanding figure in promotion of good roads throughout the world, has been named by President Hoover as chairman of the American organizing committee for this event.

This year, even more than before, the Congress offers an excellent chance to further cement the ties of economic friendship which binds American automotive men to automotive men of every race and color.

Is Industry Ready for Comeback?

HAS business decline in general and automotive retrogression in particular reached its lowest levels yet? Are we ready for the pull back up grade?

Executives are asking each other these questions with monotonous frequency these days while walking through the rough after sliced drives or while lighting up after luncheon the two-for-a-quarter cigar which does duty in place of the 1929 fifty-center.

And the answers they are giving each other vary as much by reason of the emotional constituents of the speaker, as by reason of differing degrees of familiarity with the statistics and curves known to financial writers under the pretentious appelation, Barometers of Business.

Gloom Can be Found For the Searching

REDUCTIONS in dividend rates, salary cuts and further swinging of the ax on office working forces—all noted in automotive news within the fortnight—give pessimists plenty of new fuel for their Furnaces of Gloom.

The ferocious slap of the Bear's paw which greets each Bull move on the stock exchange still makes life insurance salesmen glad and automobile salesmen worried.

Yes, there's plenty of trouble still lying around for those with time to look for it.

Looks Like Bottom is Reached

BUT we honestly believe that we have touched bottom. We believe that the automobile business, like a swimmer who has taken a deep dive, has been on the floor of the lake.

And, as the diver may press his feet on the bottom and use it to give impetus to his upward thrust, so we believe the automotive industry is now using the purging results of its depression to help it back to final new heights and new vigor.

As the diver's upward progress through the water is steady, however slow, so we believe will be the industry's climb back to real prosperity through the waning summer, through the fall, on through the winter and through the spring selling season of 1931.

Mechanical Changes Will Stimulate Sales

DEVELOPMENT work, mechanical and merchandising, curtailed during the last six months, will be renewed this fall almost of necessity.

It is our guess that such changes—several of which have just been announced—will be a *relatively* stronger sales stimulus than in boom periods. Whether or not that guess is right, of course, remains to be seen.

As the upward climb begins, the fighting, vigorous, aggressive organization will shove through the plodding ones—and through those which are lying quietly on their backs waiting for a wave of prosperity to float them to some safe haven.

Just as we believe firmly that business is soon going back on the upgrade, so firmly do we believe that our industry—like most others—is going to have to *climb* back; we are not going to be washed up by any economic tidal wave.

Tidal waves usually engulf existing communities; they rarely wash up new ones into being.

Encouragement for Youth — An Asset

A WORD, incidentally, about the college graduates of 1930, many of whom doubtless have been and are knocking for admittance at the doors of our automotive industry. These eager boys have no experience. They come into the business world at a particularly tough time because they are in competition with an unusually large supply of men who are their superiors in experience and not much their seniors in age.

Don't let's make the going any tougher for them than is necessary. Let's see to it that our industry—the personification of youth—gets its share of the fire, the enthusiasm, the idealism, the new blood which the 1930 crop of college graduate inexperience offers to the future of America.

—N.G.S.

Transmissions Designed to Multiply the Reaction on the Chassis Frame

It is impossible to float a speed-change gear on a line of shafting, as the engine structure takes the reaction to the engine torque only and the additional torque due to speed demultiplication must be provided against elsewhere

SUBSEQUENT to the publication of the description of the Spontan automatic transmission in *Automotive Industries* of April 12, we received a letter from a reader in which doubt was expressed as to the accuracy of the statement that the additional torque on the propeller shaft above the crankshaft torque is made possible by using a stationary reaction point on the inside of the transmission housing. Our correspondent informed us that he developed an inertia type transmission some time ago and the design was submitted to a mathematical expert for analysis, who reached the same conclusion that the additional torque developed in the transmission reacted on the housing, but a test made on a model transmission proved this to be incorrect.

Referring to this objection, the writer cannot discuss the merits of the test referred to, as he has no details regarding it, but he wishes to point out that it is one of the accepted laws of mechanics that wherever there is a torsional moment or a torque, there is an equal and opposite torque reaction. In a motor vehicle, when the power is being transmitted directly, the torque on the rear axle drive pinion is the same as the engine torque, and the entire torque reaction comes on the engine structure, manifesting itself in sidethrust of the pistons on the cylinder walls.

Piston Sidethrust Independent of Gear

For a given engine torque the sidethrust of the pistons on the cylinder walls is the same whether the power is being transmitted to the rear axle in direct or in first speed. As the torque on the propeller shaft is much greater in first speed, the torque reaction also is much greater, and the difference between this total torque reaction and the torque reaction in the engine structure necessarily must be taken on some other part of the chassis than the engine structure.

The above holds for all types of transmission gear. If there were no point of reaction behind the engine it would be impossible to get more than the direct engine torque on the propeller shaft. Take, for instance, a planetary type of gear as used on many small cars in the past. When this gear is locked by means of its high-speed clutch, it revolves as a unit and has no point of reaction on the chassis. In that case the torque on the propeller shaft is exactly the same as the torque on the crankshaft, and the entire reaction comes on the engine block. If now the low forward speed is engaged, one of the gears concentric with the engine crankshaft is locked to the chassis frame by means of a friction clamp, and this gear then forms the reaction ring on which the additional torque above that of the engine torque reacts.

Conditions Similar With Sliding Gear

The conditions are similar in a sliding gear transmission. When such a transmission is working in low gear, the first reduction set of gears (constant mesh gears) cause a load on the bearings of the secondary shaft which tends to cause the whole transmission case to revolve around the primary shaft in the same direction of rotation as that of the driving pinion. However, the tangential force on the pitch line of the low speed pinion produces a load on the bearings of the secondary shaft which tends to cause the transmission case to revolve around the primary shaft in the opposite direction, with a torque which is greater than the torque due to the constant-mesh set of gears in the proportion of the pitch diameter of the constant-mesh gear to the pitch diameter of the low-speed pinion. This torque on the transmission case therefore greatly predominates, and if such a transmission case were not anchored to the frame, with the transmission set for low-speed forward and engine torque applied, the transmission would revolve as a whole and no appreciable torque could be transmitted to the propeller shaft. On the other hand, if a torque arm were attached to the transmission housing and the torque on this arm were measured, it would be found to be exactly equal to the difference between the torque on the propeller shaft and the engine torque.

In the case of the Spontan transmission, the problem has to be dealt with in a somewhat different manner, because the power is transmitted to the pro-

Engine Torque Must Have Some Point of

By P. M. Heldt

peller shaft in successive impulses. By referring to the diagram of the double roller ratchet clutch herewith, it will be seen that there are three concentric sleeves. Of these, the intermediate one is the main driving sleeve through which power enters the clutch. This has a rocking motion. The outside sleeve is the reaction sleeve which is flexibly connected (or anchored) to the transmission housing by a series of coiled springs. When no power is being transmitted

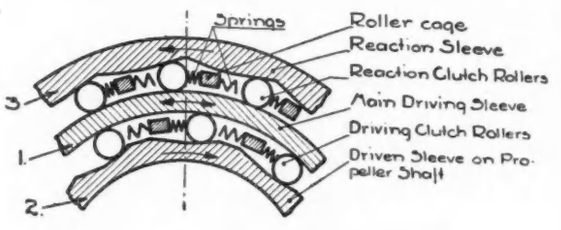


Diagram of double roller ratchet clutch of Spontan transmission

to the propeller shaft this reaction sleeve is held in a definite angular position by the radial springs. When torque is being transmitted the springs extend and allow the reaction sleeve to move through a certain angle proportional to the excess torque on the propeller shaft above that on the engine crankshaft.

Sleeve Does Not Rotate

This sleeve therefore does not rotate but merely deflects from its neutral position through an angle depending on the torque transmitted. This is indicated by the single-head arrow on it in the drawing, while the main driving sleeve has a double-head arrow on it, indicating that it constantly rocks around its neutral position. When the main driving sleeve rocks to the left the rollers engage the reaction sleeve and deflect the springs farther, while when the main driving sleeve rocks right-handedly, the deflection of the springs is reduced and the additional energy stored up in them while the main driving sleeve moved left-handedly is returned. However, when the main driving sleeve reaches the limit of its right-hand motion the springs are still under considerable deflection. The force corresponding to the average deflection represents the torque reaction which is taken on the spring anchorages on the inside of the transmission gear housing.

That it is impossible to multiply the torque along a line of shafting without exerting a reaction at some stationary point may also be proved in a general way. It might be argued, of course, that in an inertia type of transmission we have moving masses which may take up the reaction by reason of their inertia. This argument, however, is fallacious. Torque reaction can be taken directly only on masses moving around the axis of the torque moment. If such a moving mass were subjected to a torque reaction, it would be decelerated, and the angular deceleration would be equal to the quotient of the torque reaction T by the moment of inertia of the mass around the torque axis. In an inertia type of transmission the power, of course, is transmitted in the form of a succession of impulses, and it would be possible to subject the moving mass to a greater retarding moment than the accelerating moment keeping it in motion if the retarding moment acted for a correspondingly shorter time.

Torque is Continuous

However, in an automobile transmission, if T is the mean torque on the propeller shaft, this torque is continuous and the accelerating moment, the engine torque t, cannot act for a longer time than the reaction moment T. Since the driven shaft and the crankshaft are coaxial, it is obvious that the moment of inertia of the mass about both axes is the same. With the same moment of inertia and the same time of action of torsional moments, a relatively small engine torque t cannot maintain the motion of the masses against a comparatively larger retarding moment T, hence the system is inoperative.

We can therefore summarize the argument by saying that a transmission device incorporated in a line of shafting and having no other supports or points of reaction on a stationary frame than the coaxial driving and driven shafts, cannot possibly impress more torque on the driven shaft than it receives from the driving shaft, except momentarily, while the entire system is being slowed down.

Chrysler Eights Replace Imperial and "77"

(Continued from page 79)

question of size, with all the units of the Imperial stepped up in proportion to the size of the car and the increased power requirements. Rear axle tread on the Chrysler Eight is 58 in., and on the Imperial it is 60. Front tread is standard on the Chrysler Eight, and 58½ in. on the Imperial. The former has 12 in. brake drums—the latter has 15 in. drums, reinforced. Springs are approximately 3½ in. longer all around on the Imperial, as compared with the Chrysler Eight. On both they are carried in rubber "silentbloc" shackles. Other chassis parts are lubricated with Zerk-Alemite fittings.

Similarly, as will be noted from the accompanying illustrations, there is little of fundamental difference in design in the bodies. The Imperial Eight is just larger and finished in a somewhat more "custom" style. On this model, for instance, radiator shells are chrome-plated, where on the Chrysler Eight they are finished in the hood color, with chromium beading. On both models there are bullet shaped head and cowl lights with chrome-plated saddle bands. Both cars have sloping windshields, with those on the Imperial Eight in two sections, forming a Vee to match the radiator front. Sun visors are provided on the outside of the Chrysler Eight, with interior types on the Imperial. There is a single chrome beading, forming the hood hinge on the top of the hood of both cars. The Chrysler Eight has two cowl ventilators, the Imperial Eight four, two at the top and two at the side. Running-board edges, all exterior hardware, and rims of wire wheels are chrome-plated.

Seats are adjustable on both models, as are the steering columns. Both dash and floor mats are heavily lined to insulate against heat and noise. Instruments are mounted individually and include an engine heat indicator and electric fuel gage on both models, the fuel gage on the Imperial being designed to act also as an oil level gage.

Standard equipment on both cars also includes two windshield wipers, two-way hydraulic shock absorbers, treadle-type accelerator pedals, assist cords, vanity and smoking sets. In addition the Imperial Eight models have center as well as side arm rests in the rear compartment, and are equipped with cigar lighters, and clocks.

The Chrysler Imperial carries a tachometer-type of speedometer and metal spring covers as standard equipment. The fan on this model is shrouded to increase the cooling capacity, and the fuel pump is shrouded to protect it from the heat of the exhaust pipe and prevent vapor lock.

Chrysler Small Eight Prices

Roadster	$1495
Sport Roadster	1595
Standard Coupe	1495
Special Coupe	1535
Standard Sedan	1525
Special Sedan	1565
Convertible Coupe	1665

Daimler Introduces Car With "Self-Changing" Gearset

THE Daimler Co., Coventry, England, has introduced a new model embodying a transmission system that combines the advantages of the hydrodynamic coupling or fluid flywheel described in *Automotive Industries* of June 14 with the benefits of a silent planetary gearset with pre-selective control for the four speeds.

The gearset is made under Wilson patents, and is therefore similar to the "self-changing" gearset offered as an optional extra on Armstrong-Siddeley cars for two years past.

The combination of the fluid flywheel with the pre-selective gearset results in the elimination of transmission shocks and gear noises and the displacement of the friction clutch, except that a cone clutch is used in place of a dog clutch for the direct drive. In the new car, what is ordinarily the clutch pedal serves only to enable the gear ratio pre-selected by a hand lever under the steering wheel to be brought into effect.

The new model for which this transmission has been standardized has a 6-cyl. 3½ liter engine with Daimler Knight steel sleeve valves, and in general layout resembles the 25-hp. model described in *Automotive Industries* of Nov. 2, 1929. The new chassis is offered at £850 with a wheelbase of 142 in., and at £800 with a wheelbase 9 in. less. Complete cars range from £1,050 for the sedan.

To make the best use of the special transmission the overall ratios for high and third gear have been made 4 to 1 and 5.8 to 1 respectively, with the result that in high gear a road speed of 60 m.p.h. is obtained for an engine speed of only 2650 r.p.m., while speeds of 50-55 m.p.h. are within the range of the third gear. On high gear the car can be accelerated from 10 to 40 m.p.h. in 17 sec., and on third in 12.

California Leads State Gasoline Taxes

Highest tax-per-gallon was 6 cents for 1929, Department of Agriculture shows in analysis of United States

Average consumption reached 532 gal. per vehicle, with average of $17.72 per vehicle collected for taxation - - - - -

THE 48 states and the District of Columbia collected $431,636,454 in taxes on the sale of 13,400,180,062 gal. of motor fuel in 1929, reports received by the Bureau of Public Roads of the United States Department of Agriculture show. This includes a 12-month collection in 46 states and the District of Columbia, a five-month collection in Illinois and the collections of eight months in New York. Illinois and New York were the last states to adopt this method for part payment of the highway bill. The pioneer states—Oregon, Colorado, North Dakota and New Mexico—led the way in 1919. Now all the others have followed, but the tax did not become effective in New York until May 1 and in Illinois until Aug. 1.

The average fee per gallon was 3.22 cents as against three cents in 1928. In the course of the year 20 states increased the rate of taxation either one or two cents. The highest tax per gallon was six cents; the lowest two cents. At the close of the year, three states had a six-cent tax; eight a five-cent tax; 19 a four-cent tax; one, Utah, a 3½-cent tax; 10 a three-cent tax and seven states and the District of Columbia a two-cent tax.

In 1929 the rate per gallon was increased one cent in Colorado, Florida, Indiana, Kansas, Minnesota, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, South Carolina, Vermont, Washington and Wyoming; two-cent increases became effective in Georgia, Louisiana, Montana, Nebraska, Tennessee and Texas.

Comparison of the total number of vehicles registered in 1929 with the total tax collected and with the taxable gallonage in all states (except New York and Illinois) and in the District of Columbia shows an average tax revenue of $17.72 per vehicle and an average purchase of 532 gal. of gasoline.

After deducting collection costs, the entire net revenue in 34 states was used for construction and maintenance of rural roads. In the other fourteen states and the District of Columbia, a total of $24,405,207 was used for other purposes. In three states part of the tax money helped support public schools. In eight states, a part of the revenue went to cities for repair and improvement of streets, as did the entire collection for the District of Columbia. In six states, small sums were deposited in general funds, and in Mississippi, a special, extra tax was collected in two counties for seawall protection of highways.

State	Net Gallons of Gasoline Taxed and Used by Motor Vehicles	Rank
Alabama	178,162,903	25
Arizona	63,995,783	40
Arkansas	133,620,566	32
California	1,139,736,244	1
Colorado	141,466,891	30
Connecticut	202,354,590	22
Delaware	31,198,248	47
Florida	223,373,467	19
Georgia	219,609,473	20
Idaho	48,658,984	44
Illinois	388,659,266	10
Indiana	410,936,759	9
Iowa	311,859,516	15
Kansas	288,716,546	16
Kentucky	154,717,831	28
Louisiana	176,645,631	26
Maine	91,610,422	35
Maryland	157,429,197	27
Massachusetts	487,940,778	8
Michigan	710,300,302	6
Minnesota	338,631,771	13
Mississippi	140,902,401	31
Missouri	384,033,575	11
Montana	57,514,249	41
Nebraska	208,869,358	21
Nevada	16,307,535	49
New Hampshire	56,676,294	42
New Jersey	498,063,808	7
New Mexico	45,479,332	44
New York	962,601,285	3
North Carolina	260,210,528	17
North Dakota	71,591,708	38
Ohio	910,154,885	4
Oklahoma	314,388,292	14
Oregon	152,090,900	29
Pennsylvania	1,047,914,175	2
Rhode Island	77,826,879	37
South Carolina	118,038,130	34
South Dakota	88,644,138	36
Tennessee	194,497,225	24
Texas	761,421,692	5
Utah	56,546,967	43
Vermont	43,990,554	46
Virginia	197,898,821	23
Washington	233,333,570	18
West Virginia	121,654,788	33
Wisconsin	374,251,957	12
Wyoming	34,242,816	45
Dist. of Col.	71,409,032	39

Argus Develops 4-Cylinder Aero Engine

First German inverted type passes official tests in 93 hr. continuous operation under Institute supervision

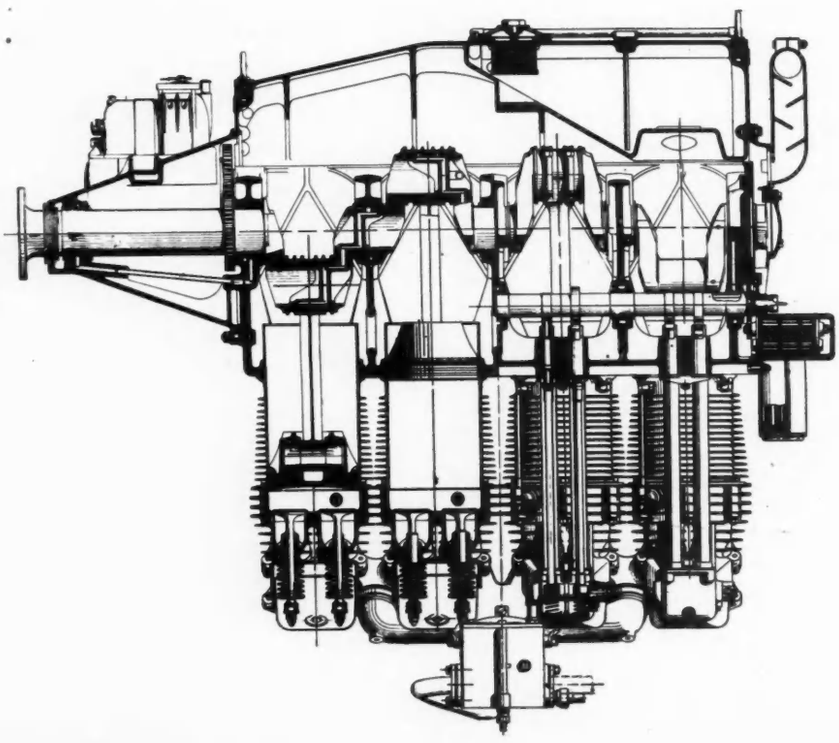
GERMANY'S first inverted air-cooled aircraft engine passed its official type test some months ago. It is a four-cylinder engine developed by the Argus Motoren Gesellschaft of Berlin, which company has been producing internal combustion engines since 1902 and aircraft engines since 1906. The new engine, which has a bore of 4.73 and a stroke of 5.51 in. (386 cu. in.), develops 80 hp. at 1400 r.p.m.

It was designed in conformity with the advice of leading aircraft experts and of the German Scientific Aeronautical Society not to attempt to further increase the weight efficiency of aircraft engines at the expense of reliability, and while the rating is comparatively low for the displacement of the engine and for its weight, 248 lb., the engine can be run under its full rated power continuously. The maximum engine speed permissible during flight is 1440 r.p.m. The compression ratio is 5.3 to 1.

The crankcase consists of two castings of magnesium alloy, the plane of the joint being considerably above the crankshaft axis. All of the five main bearings are carried by the lower section (corresponding to the upper section in an upright engine). The cylinder barrels extend a considerable distance into the crankcase, which gives added rigidity.

The upper part of the crankcase contains the oil tank, with a capacity of about 2 gal. Lubrication is by the usual combination of pressure and scavenging pumps, one of the former and two of the latter being provided. As clearly shown in the longitudinal section, the three pumps form a single unit which is bolted to the rear of the crankcase and driven by spur gears from the end of the camshaft.

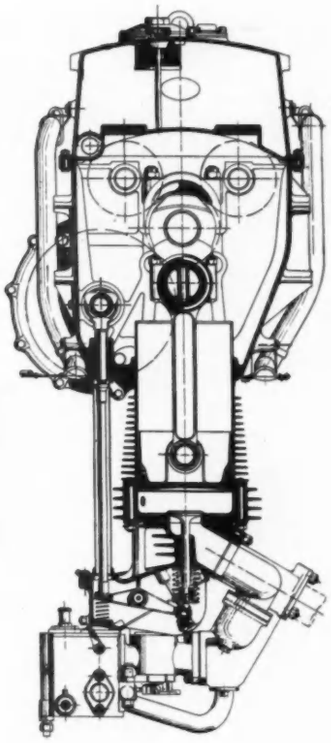
A feature of the lubrication



Cross section of Argus 80 hp. engine

Rated at 80 hp. at 1400 r.p.m.

By Edwin P. A. Heinze



Longitudinal elevation, partly in section, of Argus engine

system is the use of drilled castings inside the bores of the hollow main journals and crankpins for conducting oil from the main journals to the crankpin bearings.

At the forward end a conical housing is bolted to the crankcase which supports an extra bearing for the crankshaft extension close to the propeller flange and has formed on it a double mounting flange for the two Scintilla magnetos. These magnetos are driven from the same crankshaft pinion which drives the camshaft. Spark advance is automatic. Both the crankshaft and the connecting rods are machined from chrome-nickel steel.

The cylinder heads containing the valves are made of aluminum alloy and are secured to the cylinders by means of studs screwing into integral flanges on the head end of the steel cylinders. There are two valves per cylinder which are provided with bronze guides and dual springs.

The greater part of the housing for the valve-rocker mechanism is cast integral with the cylinder head. The lower part of the housing, which can be removed for purposes of valve-inspection is joined to the main portion at an angle. There is a small coiled spring underneath each pushrod, which takes up the clearance in the valve mechanism at points other than that between the rocker arm and the valve stem. Two spark plugs are provided for each cylinder, at opposite points of the combustion chamber. At the center of the inlet manifold there is an exhaust jacket. A Sum carburetor is flange-bolted to the manifold.

This is said to have been the first engine to pass the new and more severe type-test of the German Research Institute for Aviation. It was required to go through a test run of 93 hr. duration, including 18 hr. at full speed and with an output of 90 hp. on a new revolving test stand made by E. Becker of Berlin which revolves at 24 r.p.m. and subjects the bearings of the engine to additional loads due to centrifugal forces.

In other tests the engine was placed so its crankshaft axis sloped 35 deg. toward the horizontal in both directions, and finally it was mounted in an old-type B. F. W. plane having a low top speed, to test the effectiveness of the air-cooling under adverse conditions.

A number of German airplane manufacturers have given trial orders for this engine, which already has been adopted as standard equipment for one new plane, the Arado Ace of Clubs cabin plane, in which the excellent vision, the low center of gravity and the low location of the landing gear made possible by the inverted engine are features of particular importance.

Try Other Than Standard Lubricants

DUE to lack of space, the fuel and oil equipment specifications were omitted from the Indianapolis race story in the July 5 issue of *Automotive Industries*. As in previous years the majority of contestants used Richfield gasoline with lead, and some make of castor oil. The 1930 race was perhaps the first Indianapolis event where any great number of contestants used other than the standard mineral or castor lubricants. For instance, the Samson special and Bowes Seal Fast cars, winners of third and fourth places, used regular racing oils to which were added a certain quantity of Shaler Rislone penetrative type lubricant.

The Guiberson special, Hoosier Pete special and the Jones and Maley Miller front drive, which placed sixth, used only Conoco, a germ or acid processed lubricant. In addition to the lubricants mentioned Pennzoil, Vacuum, Waverly and Oilzum were represented as equipment on other starters.

Correction

IN the description of the new hood latch offered by Automotive Fan & Bearing Co., carried in the July 5 issue of *Automotive Industries*, reference was made to the method of lifting the hood. We are advised by the manufacturers that a separate hood lift handle is provided to raise the hood, in the same manner as in conventional hood designs, the hood latches being used only for locking and unlocking the hood.

Headlamps Controlled Through Steering Gear

A NEW headlamp direction control device has been placed on the market in Germany by the Siemens-Schuckert Works of Berlin. The control is entirely independent of the headlamps themselves and, therefore, can be used in connection with any headlight design. Operation of the control is effected automatically through the steering gear in such a manner that road shocks are not transmitted to the lamp, it is claimed. For small deviations from the straight-ahead course, the headlamp beams are deflected several times as much as the front wheels, but with increasing deviation the motion of the beams is slowed up, so that the curve is always uniformly illuminated.

Connection between the two lamps being by a linkage similar to that between the two steering knuckles, the lamp on the inner side of the curve is turned through a larger angle than the other one, so that the edge of the road on the inside of the curve is preilluminated, to use the words of the manufacturers. After the curve has been negotiated the lamps return automatically to their central position, in which they are firmly held. In daylight the headlamp control system is completely uncoupled and the lamps are firmly locked in position.

The complete control device comprises two mechanical relays consisting of a spur pinion and a rack each. The first of these relays is mounted on the frame side rail underneath the front fender and therefore is hidden from view. Its pinion shaft is provided with an arm which connects by a link to the steering arm. In order to prevent interference with the operation of the steering gear in case anything should go wrong with the headlight control, this link is provided with a coupling at the middle of its length.

From the rack of the first relay there is a connection by a form of Bowden wire mechanism to the second relay, which is mounted on the usual lamp bracket. The wire mechanism consists of a spring-steel wire passing through a metal conduit with tubular brass sheathing. A plan view of the second relay with the cover removed is shown in Fig. 2. This shows the rack *b* meshing with the spur pinion *a*. The roller lever or bell crank *c*, which turns on the same axis as pinion *a*, engages with one arm into the slot of the guide *e* which swings around the axis *f*, the latter also being the axis of the headlamp mounting. Whenever the roller lever *c* is coupled to the gear pinion *a* by means of the latch *g* the direction of the headlamps can be controlled. If the latch is disengaged from the pinion (from the driver's seat) through the intermediary of the Bowden wire mechanism *i* and the latch lever *h*, the guide *e* and the headlamp are in their central positions.

In order to hold both headlamps rigidly in their central positions, two pressure springs *a* and *b* are provided, which are located in a housing of exactly the same outside form as the housing for the relay. These springs act on the spring-yoke *c* which is coaxial with the headlamp mounting. Both housings are said to be absolutely waterproof.

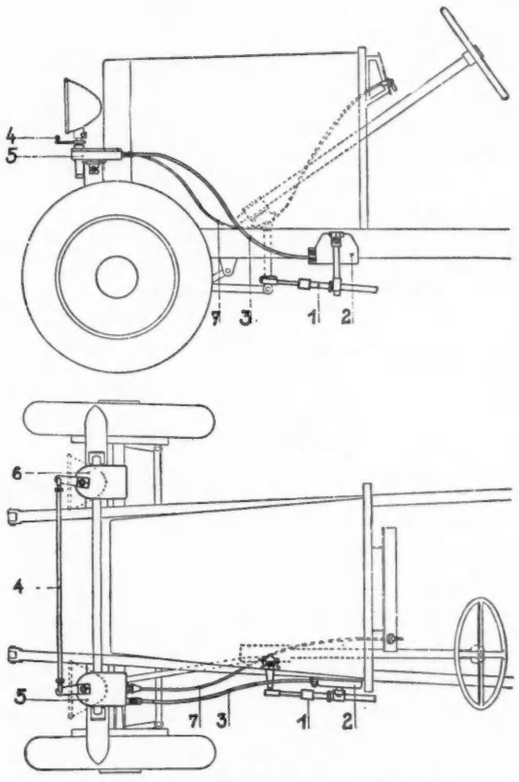


Fig. 1—General assembly views of Siemens-Schuckert headlamp control

Fig. 2—Plan view of control relay

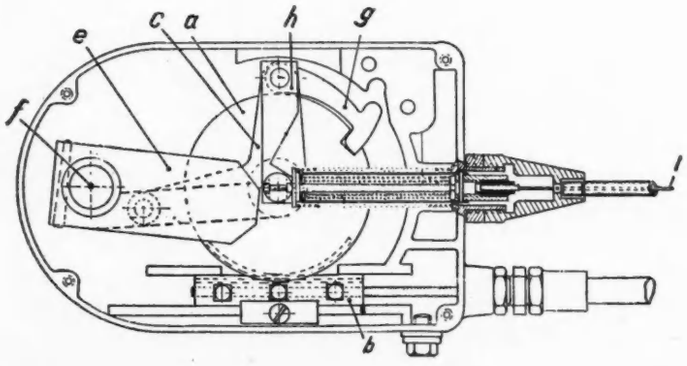
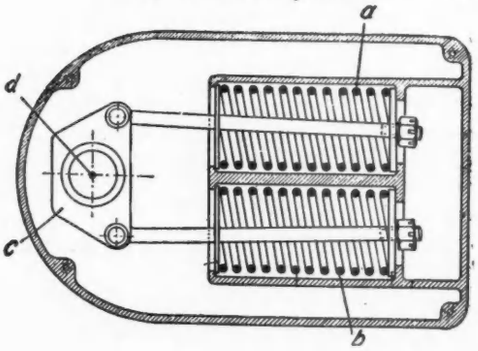


Fig. 3—Springs holding headlamps firmly in central position - - -



The Forum

High Speed Oil Engine Development

Editor, AUTOMOTIVE INDUSTRIES:

The comment in your May 31 issue by Leigh M. Griffith on my article of April 26 makes clear that he has considered it in some detail. It is not so clear that he grasps the purpose of my article.

Many times we get farther at an earlier date by admitting a difficulty in a project, and then bringing all reasonable aids to bear on that difficulty. The article is intended to suggest aid from the chemist in order to obtain in compression-ignition engines a high m.e.p. with a maximum pressure more comparable with that of its competitor, the carburetor engine. This would aid in taking care of the weight problem mentioned by Mr. Griffith as of concern. The carburetor engine industry is not loath to recognize the value to it of the chemist.

Regarding the citation by Mr. Griffith of Ricardo results, it is safe to say, I believe, that Ricardo's results have not been surpassed in excellence. But, between a laboratory test block and a truck on a long grade, there may be considerable difference. The Ricardo results were from a design of engine with particular advantages for its task. It is a sleeve-valve engine. Whether sleeve-valve engines will be acceptable to the entire industry, is an issue.

Furthermore, Ricardo uses gas-oil—a distillate—rather than fuel oil. To stop at straight gas-oil and to delay engine progress by years when the chemist can probably give us something better at an attractive price, impresses one as cramping our outlook. Engineers, unfortunately, cannot either today or tomorrow set the price even of fuel oil, but it seems logical to interest chemists in desirable fuel characteristics that we may be offered what we want, rather than what the oil industry wants us to accept.

Road conditions of temperature may be more critical for an engine using compression ignition when the cycle obtained is Otto rather than Diesel. (To call high-speed oil engines Diesels may obscure the picture seriously.) A noted experimenter states somewhere that the rate of combustion may vary as the cube of the absolute temperature. And with compression ignition, combustion begins at a pressure where often the maximum pressure ends in the carburetor engine.

As regards controlling fuel injection, its control mechanism is more complicated than with a carburetor. Though with the Diesel cycle a little extra fuel may bump only the fuel bill, with an Otto cycle and compression ignition, something else may get bumped. If the chemist can soften that bump, let the honor be his, and—what is, strangely, too commonly ignored in outlining technical procedure, though on Wall Street always provided as an incentive of the first order—also assure him a little of something handy in trade.

My article was by no means intended as an S.O.S. either for or to makers of compression-ignition engines.

ROBERTSON MATTHEWS.

Origin of the Front Drive

Editor, AUTOMOTIVE INDUSTRIES:

In the Forum of the May 31 issue of the *Automotive Industries* a discussion seems to be brewing concerning the origin of "front-wheel drive." Having made investigation on this subject last February because of a similar claim being made for the old and famous Christie front-drive racer, I am prepared to pass on the information to you.

As it happens, on the next page of the same issue is illustrated the machine built by Joseph Cugnot—probably the world's first self-propelled vehicle, with power applied to the front wheel.

In my files I have some pictures of electric front-wheel drive broughams built by Healey & Co., of New York, in 1904, or thereabouts.

France was the home of other steam front-drive cars, besides that of Cugnot's, for in 1883 Count De Dion built a car of that type, and another such vehicle was made by him in 1885.

The first car built by the famous George B. Selden of Rochester, N. Y., in 1877, had a gasoline engine mounted on the front axle and driving the front wheels through spur gears.

In 1898, E. J. Pennington, an American, displayed at the Crystal Palace in London a gasoline front-drive car called the Pennington Raft. A similar car was built by the Humber company of England in 1899.

It seems to me that the foregoing is sufficient proof that no person living today can lay claim to being the originator of "front-wheel drive."

It is not my intention to belittle nor disregard anyone's contribution to the development of this type of drive, but merely to point out the historical facts of the case, which apparently are not known to many.

W. EVERETT MILLER.

Berlin Taxis Add Innovations

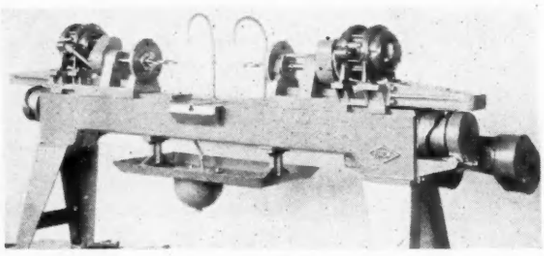
TWO new ideas in connection with applications of automotive equipment are being heralded from Berlin. The Kraft-Tag Droschken Gesellschaft, a taxi-operating concern, has equipped every one of its vehicles with an umbrella. On rainy days the driver raises this umbrella and accompanies fares to the entrance of the building which they wish to enter. The Berlin police have equipped a truck chassis with a tank having a capacity of 1500 gal. A nozzle is located on top of the vehicle and can be directed from inside in the same way as machine guns on armored cars. The machine, which is completely armored, is intended for subduing riots.

NEW DEVELOPMENTS—AUTOMOTIVE

Frew Duplex Horizontal Driller

THE No. 00-C machine for drilling and reaming from both ends is announced by the Frew Machine Co., Philadelphia, Pa.

It is all motor-driven, each head having its own motor and a separate motor for driving the feed. The bed is a one-piece box-type casting, provided with dovetailed ways on which the heads slide. Running through the bed is a heavy shaft carrying a cam at each end. The camshaft is driven



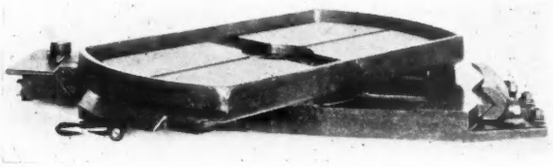
by means of worm and worm gear through suitable gear reductions, and pickoff change gears are provided so that the rate of feed can be varied. The feed motor is mounted on a bracket attached to the back of the bed and geared to the worm-gear unit.

The heads have a long-gibbed surface with space for mounting the motor, which is geared to the spindle. Attached to the rear of the head is the cam slide, carrying the cam block, which is adjustable for varying the distances between spindle ends. The front ends of the head units have a large flat surface to which multiple heads can be bolted. Movement of the heads is mechanically controlled by cams at either end of the bed, so that the operator simply has to load and unload a fixture.

The machine shown here is equipped with 1-hp. motors, but the size depends upon the nature of the work. Floor space is 9 ft. x 2 ft.

B & S Standard Index Bases

BROWN & SHARPE MFG. CO., Providence, R. I., announce the addition of the Nos. 2 and 13 Standard Index Bases to their line of milling machine attachments. These attachments are designed primarily for use on the Brown & Sharpe plain milling machines which possess automatic or semi-automatic table movements. Both sizes are similar in design and consist of a heavy base, bolted to the table of the machine, on which is mounted a swivel. The swivel rotates on a heavy pivot and is locked and held rigidly

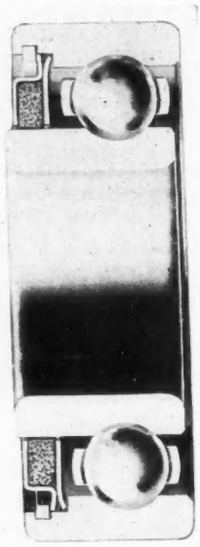


in position by a taper plunger operated by a hand lever. It can be indexed through 360 deg., with working positions at 0 deg. and 180 deg. The contact surfaces are scraped, assuring correct alignment and rigidity. Various types of fixtures, both regular and special, are adaptable for use with this attachment.

The Standard Index Bases are furnished with a reversible tongue for aligning them on the table of the milling machine. A tongue slot for aligning fixtures is cut on the swivel.

SKF Develops New Type of Felt-Seal Ball Bearing

SKF INDUSTRIES, INC., New York, has developed a new type of ball bearing in which a felt seal is provided as an integral part of the bearing, so only one housing enclosure needs to be provided where this bearing is used. The outer and inner races as well as the balls are made of high carbon, chrome-alloy steel, hardened throughout. The bore and outside diameter are ground to the same standard dimensions and tolerances as the corresponding single row bearings, but the width is slightly greater. The inner race projects a little beyond the face of the seal in order that the bearing may be pulled off the shaft at any time without damaging the seal plates.



SKF felt-seal ball bearing in section

Referring to the sectional illustration, the seal consists of an inner steel plate which is dished at its periphery and bears against a shoulder formed on the outer race. Next comes a removable felt, then a dished steel end plate, and finally a split steel ring which is fitted into a groove in the outer race to hold the assembly in place.

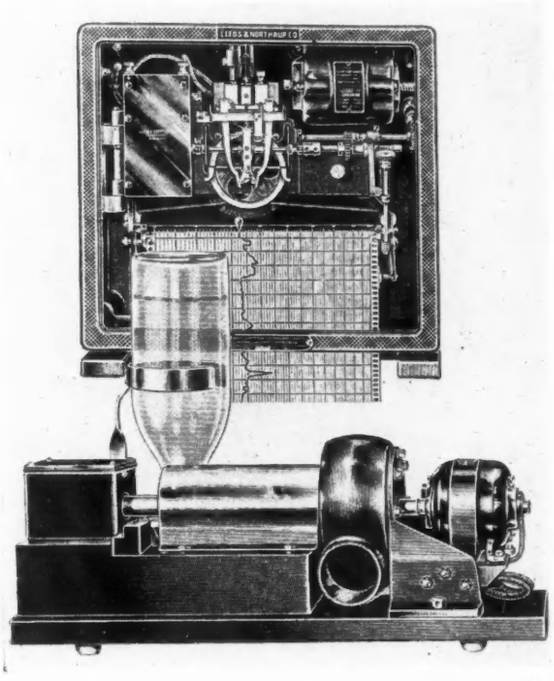
A feature of the design is its ease of disassembly. After springing the split steel ring

PARTS, ACCESSORIES AND PRODUCTION TOOLS

out of the groove in the outer race, all the other component parts of the seal may be readily lifted out. The bearing is available in sizes suitable for fractional horsepower and other motors, portable tools, and other light equipment.

Leeds & Northrup Humidity Recorder

LEEDS & NORTHRUP COMPANY, Philadelphia, Pa., has placed on the market an instrument producing a continuous record of the relative humidity of the atmosphere at the place where its humidity-sensitive element is located. Heretofore wet and dry bulb thermometers have been used for determining humidity in the atmosphere. From the difference in the readings of the two instruments the relative humidity was determined by reference to a table.



The new Leeds & Northrup instrument is based on the principle that for any given relative humidity in the atmosphere there is a linear relation between the dry-bulb and wet-bulb readings, but the slope of the line varies with the relative humidity. The relative humidity of the air is the ratio of its actual humidity content to the maximum humidity it will hold at the particular temperature.

The instrument comprises two electric resistance thermometers which are placed in a current of the air to be tested, this air being blown over them by a small fan. The bulb of one of the thermometers is saturated with water while the other is dry, and the two instruments therefore indicate different temperatures.

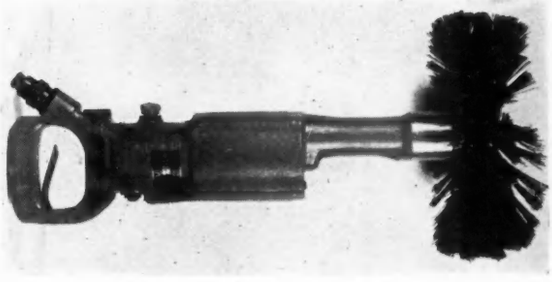
The two electrical thermometers are each included in what amounts to a Wheatstone bridge circuit, each such circuit comprising three fixed resistances and a fourth variable resistance, the thermometer. One of these bridge circuits is provided with a sliding resistance connected to the two points to which the galvanometer connects in the ordinary Wheatstone bridge.

The two circuits are connected together and a galvanometer is connected between the sliding contact of the sliding resistance and a point on the other bridge circuit. For a certain adjustment of the sliding resistance there will be no current flow through the galvanometer, and this adjustment represents the relative humidity.

In the humidity recorder this adjustment is made continuously by a mechanism similar to that employed in the Leeds & Northrup recording pyrometer.

Portable Air Wire Brush and Grinder

WIRE-BRUSHING scale and rust is one of the important applications of the No. 315-4 heavy-duty air tool recently added by the Buckeye Portable Tool Co., Dayton, Ohio. In design and principle of operation, this tool is similar to their familiar No. 300 series.



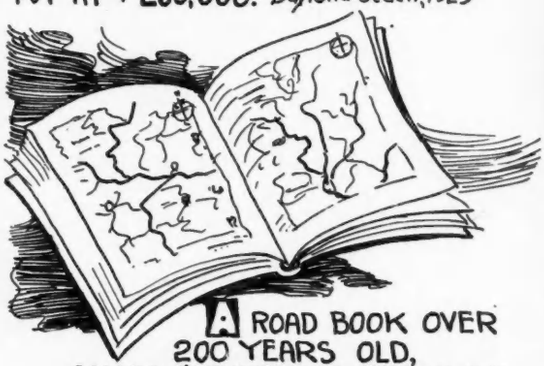
It is available in a speed range of 2000, 3100 and 4000 r.p.m. Net weight is 13 lb.

Correction

THE new Gridley heavy-duty, four-spindle automatic of the National Acme Co. was termed in these columns recently the "6A" in error, instead of the correct name, "GA."

Automotive Oddities—By Pete Keenan

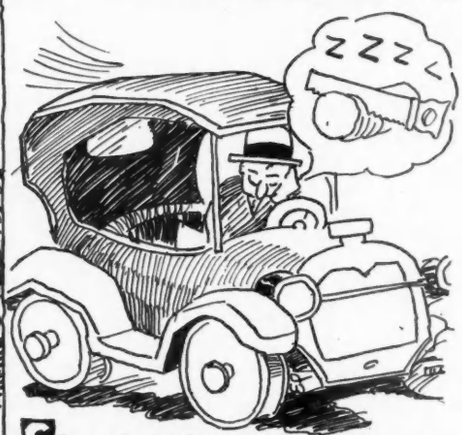
THE COST OF THE WORLD'S SPEED RECORD HELD BY SIR HENRY SEGRAVE, INCLUDING CONSTRUCTION OF CAR, WAS PUT AT $250,000. *Daytona Beach, 1929*



A ROAD BOOK OVER 200 YEARS OLD, CALLED "BRITANNIA DEPICTA", ISSUED BY INIGO OWEN. *London, England.*

AN AFRICAN CHIEF ORDERED HIS CAR TO BE DRIVEN AT ALL TIMES IN LOW GEAR AS THE NOISE LENT DIGNITY TO HIS PRESENCE. *Contributed by Geo F. Bauer, N.A.C.C.*

THE FIRST AIR PASSENGERS: A COCK, A DUCK AND A SHEEP; SENT UP IN A MONTGOLFIERE HOT AIR BALLOON. *France, 1783.*



GEORGE DOBSON HAD THE FOUR TIRES STOLEN FROM THE WHEELS OF HIS CAR WHILE HE DOZED AT THE WHEEL. *Westfield, N.J. 1930.*

NEWS OF THE INDUSTRY

Truck Executives Talk Legislation

Group Meets Under Leadership of National Automobile Chamber of Commerce

NEW YORK, July 17—Closer co-operation among trucking interests in the various states to promote their interests and prevent oppressive and conflicting legislation was sought by the truck association executives of America in a two-day session here yesterday and today.

Truck association executives from Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Ohio, Indiana, Kentucky and Maryland attended this meeting held jointly by the executives and the truck department of the N.A.C.C. Henry C. Kelting of Kentucky was chairman of the meeting and Tom Snyder, secretary of the truck association executives of America, acted as secretary.

The meeting was made up largely of symposiums on types of meetings best suited to bring out membership and types of service that can be rendered. Membership campaigns and legislative work took up most of the meetings under the direction of Edward F. Loomis, secretary of the Motor Truck Committee of N.A.C.C. Various members of his staff explained their work and told the executives what type of co-operation may be expected from the N.A.C.C.

Richard S. Armstrong, secretary of the Motor Vehicle Conference Committee, explained the function of the national committee and of various state committees in assisting to combat oppressive legislation and secure favorable legislation.

La Rue Brown, chief counsel for the chamber truck department, outlined the dangers of neglect to watch legislation by giving several examples. Members of the conference devoted Wednesday afternoon to golf and sightseeing.

Surveys Michigan Traffic

WASHINGTON, July 17—In an effort to determine how much of the cost of local roads in Michigan should be paid by local taxpayers and how much should be spread over the state, the Bureau of Public Roads of the U. S. Department of Agriculture, in cooperation with the Michigan State Highway Department, is making an origin-and-destination traffic survey on all roads, local as well as main state highways, in sample townships in the 83 counties in the state.

Budd Companies Report Earnings

PHILADELPHIA, July 17—Net earnings of the Edward G. Budd Mfg. Co. for the second quarter of this year were $297,803, according to an announcement by H. A. Coward, secretary. This compares with $110,408 earned during the first quarter. A dividend of $1.75 per share on the preferred stock, and the regular quarterly payment of 25 cents a share on the common were authorized by the directors at their quarterly meeting. Both dividends are payable Aug. 1 to stockholders of record July 28.

Net earnings of the Budd Wheel Co. for the second quarter of the year reached $511,518, according to the announcement, bringing the first half earnings to $925,132. After provisions for payment of dividends on preferred issues, earnings on the common stock were 50 cents for the second quarter, compared with 40 cents for the first.

Both the Budd companies are reported to be in exceptionally strong cash position, with no bank indebtedness outstanding. The earnings reports are net in both cases, excluding all charges, including provision for Federal taxes.

Sorenson Returns to U. S.

NEW YORK, July 15—Charles E. Sorenson, general manager of the Ford Motor Co., returned yesterday on the North German Lloyd Liner Bremen from a trip to Europe occupying five weeks. He said that final arrangements for the manufacture of Ford cars by Isotta-Fraschini in Italy will be completed within a few days.

Otis Steel Adding to Plants

NEW YORK, July 16—Directors of the Otis Steel Co., Cleveland, have authorized an important expansion program including the building of a new continuous rolling mill and a survey looking to the manufacture of alloy steel, it has been announced by E. J. Kulas, president. The improvements, when completed, will involve expenditures of about $5,000,000.

Canadian Exports Hold Up for May

Decrease Only 1.4 Per Cent Compared With April of This Year

WASHINGTON, July 17—May Canadian exports of motor vehicles reached a valuation of $1,329,157, a decrease of only 1.4 per cent, as compared with April, 1930, shipments which are valued at $1,349,325, although 68 per cent below the total of $4,230,336 exported in May a year ago, according to the Automotive Division, Bureau of Foreign and Domestic Commerce.

Total production increased 1.7 per cent over the output in April, 1930, and was the highest for any month since May of last year. All classifications showed slight increases over April, 1930, with the exception of trucks which decreased 10 per cent; the output of passenger cars and chassis gained one and eight per cent respectively.

Production in the first five months of 1930 was 43 per cent below the output in the same period of 1929, while the number of units manufactured in the month of May was 21 per cent below the figure for May, 1929.

Total exports in May were seven per cent lower than in April, 1930, but they compared less favorably with shipments in May a year ago, registering a decrease of 68 per cent. Exports in the first five months of 1930 were less than half the number shipped in the corresponding period of 1929, when exports totaled 51,495 units. Exports of passenger cars declined seven per cent and and trucks 7.7 per cent. Shipments of passenger cars valued over $500 to $1,000 were the only classification which showed an increase.

The increase in exports of medium-priced passenger car units was reflected in the average value of passenger cars exported in May, $466, while in March and April it was $406 and $424, respectively.

Krieger Leaves Durant

DETROIT, July 17—M. H. Krieger yesterday announced his resignation as factory manager of the Durant plant at Lansing. Mr. Krieger was one of the first men on the Durant payroll in Lansing, taking up his first duties even before the first plant was erected there in 1921.

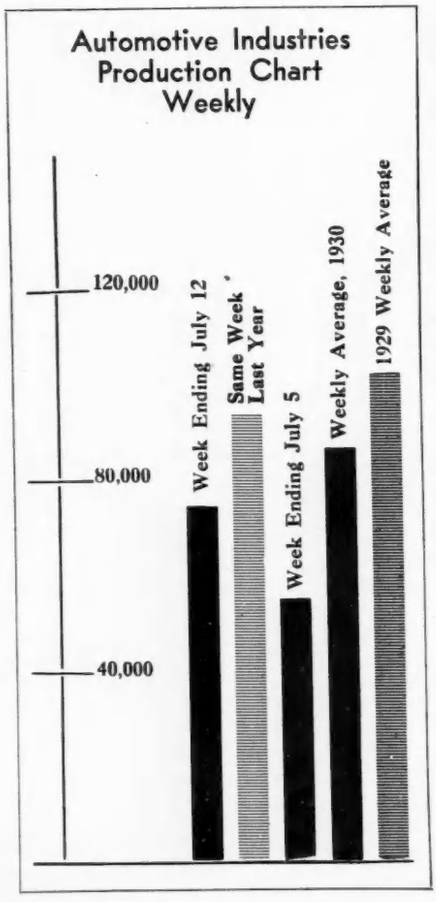
— Men of the Industry —

Buick Salesmen Visit Factory

More than 175 Buick salesmen and sales executives were in Flint, Mich., today and yesterday as guests of the Buick Motor Co., for a two-day convention which took the men to Detroit and the General Motors Proving Ground, near Milford, Mich. The men, who represent all parts of the country, are visiting the factory as a result of their outstanding efforts in the "Great Buick World Series," a sales contest conducted nationally during April and May. The men were addressed by C. F. Kettering, vice-president of General Motors in charge of engineering research; E. T. Strong, president, and C. W. Churchill, general sales manager, and other Buick executives.

Chayne Joins Buick

F. A. Bower, chief engineer of the Buick Motor Co., has announced the appointment of Charles A. Chayne, formerly in charge of development design for the Marmon Motor Car Co., as head of the motor division of the Buick Motor Co. Before entering the automobile field, Mr. Chayne was for seven years instructor of mechanical engineering at the Massachusetts Institute of Technology. His first position in the automobile industry was with the engineering department of the Lycoming Mfg. Co.



Malcolm Back in Detroit

George M. Malcolm, director of export for the Hupp Motor Car Corp., has just returned to Detroit following a trip around the world, during which he visited more than a score of countries in the interest of Hupmobile. Mr. Malcolm pointed out particularly that France is "perhaps the brightest spot on the globe today and that Hupmobile's business was never better in that country than it is today and that future prospects are very bright."

Carpenter Expected to Sail

Ralph E. Carpenter, vice-president and general manager of the Spicer Mfg. Corp., made reservations to sail for Europe on the *Leviathan* on Wednesday, July 16, to attend board meetings of the British and French companies as well as to call upon a number of Spicer companies in Europe and the British Isles.

Reo Appoints Spencer

E. G. Poxson, general sales manager of the Reo Motor Car Co., has announced the appointment of K. Ray Spencer as regional manager in charge of the central region. Since 1925 Mr. Spencer has been with Chrysler as regional sales manager. Before that he was associated with Dodge Brothers for many years, in charge of various district offices.

Nelson Goes to Russia

A. W. Nelson, western representative of the Linn Manufacturing Co. division of LaFrance-Republic, is being sent to Russia for four months by his company. He will be attached to Amtorg Trading Corp. and will advise Russian engineers on maintenance and operation of Linn tractor trucks on various construction jobs.

Miller Given Party

William H. Miller, New England sales manager for Pratt & Whitney Co., was given a surprise party by his associates to mark the fortieth anniversary of his service with the company. He was presented at his office with a basket of flowers and a wristwatch.

Durant Visits Lansing

W. C. Durant was in Lansing, Mich., Sunday and yesterday conferring with F. J. Haynes, president, and other executives of Durant Motors, Inc.

Caron Joins Agency

John M. Caron, who recently resigned as assistant advertising manager of the Chrysler Sales Corp., has joined the staff of Brooke, Smith and French, Inc., advertising agency, Detroit.

Steel Plant Expansion Features Light Market

Regarded as Favorable Comment on Long-Term Prospects

NEW YORK, July 17—One of the outstanding features of the prevailing period of light demand for steel products is that it is accompanied by announcements of numerous plant extensions and improvements. The trend of modernization programs is still toward more continuous rolling equipment in sheet mills and paired with this is the metallurgical development of improved alloy steels.

According to the latest figures of the American Iron and Steel Institute, last year's output of alloy steels was 3,957,200 gross tons—one ton of alloy steel for every 14.3 tons of total steel production, as compared with an output of 181,900 tons of alloy steel in 1909 or one ton of alloy steel for every 131.6 tons of total steel production. Continuous rolling in sheet mills as well as the growth of the alloy steel industry came in response to automotive demand, and when hard-headed financiers authorize at the present low stage of steel buying the investment of millions in the expansion of continuous rolling and alloy steel production, their decisions furnish an eloquent answer in dollars and cents to the question of what is the long range outlook for automotive consumption of steel.

Another interesting feature of these developments is the steadily growing contact between European and American metallurgical laboratories with a view to the profitable marketing of alloy improvements. While undoubtedly sales of cold-finished steel bars have been made in some instances on a 2 cent, Pittsburgh, basis, producers insist that 2.10 cent continues to be the ruling quotation. The market, as a whole, is entirely unchanged.

Pig Iron—Quite a few Middle West automotive foundries are not taking any iron because of temporary shutdowns. Competition between Valley and Cleveland district blast furnaces is keen, and the market's giving way to the extent of 50 cents a ton did not bring out much business.

Aluminum—Automotive demand is very light. Better demand for August is predicted by those in contact with automotive aluminum foundries. Prices remain unaltered.

Copper—The market's statistical position continues to favor buyers, an increase of 8000 tons in refined copper stocks being disclosed by June statistics. Producers' quotation as well as the "outside" market hold at 11½ cents.

Tin—The market shows a shade more steadiness, having opened at 29⅜ cents for the week.

Lead—Unchanged amid moderate demand for spot metal.

Zinc—Producers are not disposed to commit themselves for deferred deliveries at prevailing prices.

Chrysler Marine Sales Gain

DETROIT, July 15—Sales of Chrysler Marine engines in May were 80 per cent above those of May 1929, according to H. E. Fromm, sales manager of the Marine Engine Division. Mr. Fromm attributes this gain to the more complete lineup and to the addition of the new "Majestic" straight eight, 150 hp. engine.

Fred J. Robinson Dies in Accident

Was Connected With Business Papers For 19 Years

CHICAGO, July 16—Fred J. Robinson, Chicago office manager of the Chilton Class Journal Co., was fatally injured in an automobile accident on the Outer Drive at 7.30 this morning. He died in the Chicago Memorial Hospital a few minutes after being received.

Mr. Robinson joined the Class Journal Co., Chicago, in November of 1911, after a successful interval as specialist in automotive advertising for the *Chicago Tribune*. When the Class Journal Co. was merged with the Chilton Co., as the Chilton Class Journal Co., Mr. Robinson continued his connection, and his death terminated 19 years of continuous service.

He was born in Chicago and graduated from the University of Chicago. For a few years after his graduation he worked for his brother, who was in the table-mat business, and then joined the *Chicago Tribune* classified advertising department. He was a member of the Psi Upsilon fraternity, and of several clubs in the Chicago area.

Lansing to Honor Olds

DETROIT, July 15—The city of Lansing has decided to establish a memorial park commemorating the construction of the first automobile by Ransom E. Olds and the birth of the automobile industry in that city. Acting upon a recommendation by the local chamber of commerce, the city council last night passed a resolution to devote a small piece of city-owned property, only a few feet from the spot where Mr. Olds built his first car, to that purpose and to erect a bronze replica of this first car and a tablet narrating the inception of the automobile industry in Lansing.

Graham Body Plant to Close

EVANSVILLE, IND., July 14—Manufacturing departments will halt operations July 15, and offices will close July 19 at the local plant of the Graham-Paige Body Corp. until Aug. 4 for annual vacation period, J. W. Evans, factory manager, has announced. A sufficiently large volume of orders have been received to insure a considerably extended period of production activity following the vacation period, he stated.

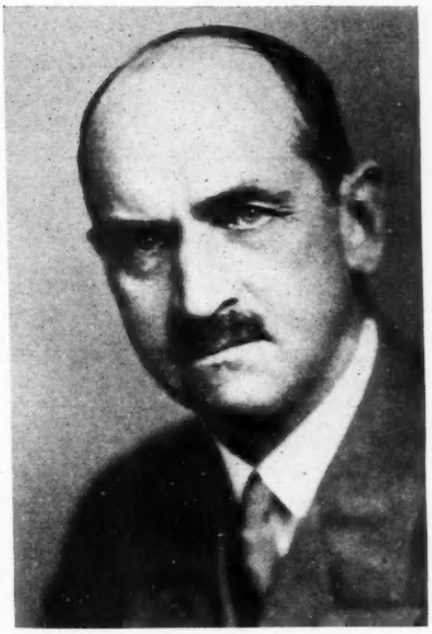
Walter C. Bender

LOS ANGELES, July 15—Walter C. Bender, vice-president, the Ahlberg Bearing Co. of California, Inc., died July 9, according to an announcement from the company.

Curtiss-Wright Elects Russell

On being elected vice-president of the Curtiss-Wright Corp., Frank H. Russell, recently resigned as vice-president of the Curtiss Aeroplane & Motor Co., a position which he has held for the past 11 years.

Seriously ill



Glenn H. Curtiss
Aviation pioneer who is facing an appendicitis operation in a Syracuse hospital - - - - -

Financial Notes

Jordan Motor Car Co. reports net loss for the quarter ended March 31 of $262,695. This compares with profit for the corresponding quarter of 1929 of $57,508.

Martin Parry Corp. reports net loss for the quarter ended May 31 of $44,027. This compares with a net profit for the corresponding quarter of last year of $8,891, or seven cents a share.

Allis-Chalmers Mfg. Co. has declared regular quarterly dividend of 75 cents payable Aug. 15 to stockholders of record July 24.

Fokker Aircraft Corp. of America has declared regular quarterly dividend of 43¾ cents on preferred payable July 15 to stockholders of record June 23.

American Forging and Socket Co. directors, at their last meeting, declared the regular dividend of 50 cents a share on the no-par common stock outstanding. The dividend is payable Aug. 1 to stockholders of record July 19.

Moreland Motor Truck Co. has declared deferred quarterly dividend of 17½ cents on seven per cent preferred stock due July 1.

Motor Wheel Corp. After July 28, 1930, old certificates of the Motor Wheel Corp., Lansing, Mich., will not be accepted by brokers, and the company is notifying its stockholders of the action of the committee on securities of the New York Stock Exchange, as of June 27. The ruling says: "Delivery of Motor Wheel Corp. common stock up to and including July 28, 1930, may be made with either old certificates or permanent certificates at present being issued—100 share blue—odd lot red. Beginning July 29, 1930, only permanent certificates at present being issued will be a delivery."

Bohn Aluminum & Brass Corp. reports net profit for the six months ended June 30 of $688,766 after all charges. This is equivalent to $1.95 a share and compares with earnings of $1,781,579, or $5.08 a share, for the corresponding period a year ago.

Electric Storage Battery Co. has declared regular quarterly dividend of $1.25 on common and preferred, respectively, both payable Oct. 1 to stockholders of record Sept. 9.

Reduction of Inventory Reported by Tire Makers

Increase in May Regarded As Seasonal Effect

NEW YORK, July 15—The tire producing industry has followed the automobile producing industry in reducing production to meet more nearly the needs of retail demand, according to figures just released by The Rubber Manufacturers Association.

During the first five months of the current year production exceeded shipment by less than seven per cent, as compared with 12 per cent for the same period last year, 11 per cent in 1928, nine per cent in 1927 and 20 per cent in 1926.

As evidence of the effectiveness of this policy, inventories of pneumatic casings on hand May 31 are 20 per cent below May 31 of last year, although they do register 2.7 per cent increase over April 30 of this year, which is regarded as a seasonal increase.

Shipments of pneumatic casings for the month of May amounted to 5,564,-236, representing an increase over April, and a decrease when compared with May of 1928 and 1929.

Approximate comparative figures for the industry based on reports received by the association from its members, which are taken to represent 75 per cent of the industry as a whole, are as follows:

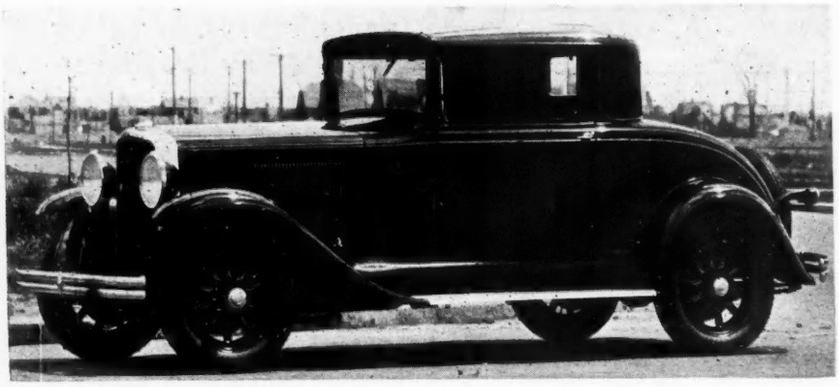
		Inventory	Production	Shipments
Pneumatic Casings—All Types				
May	1930....	13,920,000	6,098,000	5,564,000
April	1930....	13,890,000	6,140,000	5,415,000
May	1929....	17,730,000	8,140,000	7,180,000
Inner Tubes				
May	1930....	14,760,000	5,900,000	5,410,000
April	1930....	14,700,000	5,880,000	5,170,000
May	1929....	18,920,000	7,160,000	7,040,000
Balloon Casings				
May	1930....	11,100,000	5,320,000	4,660,000
April	1930....	10,610,000	5,135,000	4,610,000
May	1929....	12,060,000	6,310,000	5,370,000
Balloon Tubes				
May	1930....	10,790,000	4,990,000	4,380,000
April	1930....	10,500,000	4,975,000	4,270,000
May	1929....	12,220,000	6,110,000	5,060,000
High Pressure Cord Casings				
May	1930....	3,228,000	824,000	902,000
April	1930....	3,321,000	875,000	814,000
May	1929....	5,710,000	1,829,000	1,808,000
High Pressure Inner Tubes				
May	1930....	3,978,000	911,000	1,026,000
April	1930....	4,190,000	904,000	899,000
May	1929....	6,680,000	1,537,000	1,973,000

Cartwright in Production

INDIANAPOLIS, July 14—Forest S. Cartwright of the Cartwright Automatic Gear Shift Corp. announces that the company has secured a factory site at Indianapolis. Machinery has been installed and production has been started on the making of automatic shifts for the Model A Ford. Later, shifts will be made for the Chevrolet and other cars.

Abandons Retail Outlet

BOSTON, July 17—The Graham-Paige Co. of New England is to be operated hereafter as an exclusively wholesale organization following a visit here of Vice-President Robert Graham, at which the details were worked out.



New Graham-Paige Coupe

Graham-Paige Motors Corp. has announced the addition of this two-passenger business coupe to its standard six line. The new model, which lists at $895, f.o.b. Detroit, is 1½ in. wider in the body than the two-passenger De Luxe coupe in the same line - - -

Automobile Financing Betters April Figures

WASHINGTON, July 18—The number of automobile financed during May, as reported to the Department of Commerce by 455 automobile-financing organizations, was 346,515 on which $146,191,179 was advanced, as compared with 341,842 on which $144,891,375 was advanced in April and 398,561 on which $183,580,808 was advanced a year ago. Wholesale financing during May was $82,029,398, as compared with $84,228,709 in April and $72,098,629 a year ago.

This summary will be subject to revision in subsequent issues as reports are received from additional concerns.

Clark Reports Earnings

CHICAGO, July 15—Clark Equipment Co. reports net earnings for the six months ended June 30 of $522,715, which is equivalent to $1.93 a share on the 249,838 common shares outstanding after the preferred dividend. Earnings for the quarter ended June 30 totaled 91 cents a share as compared with $1.02 a share for the same period in 1929.

The balance sheet as of June 30 shows cash and cash assets, including marketable securities at cost, of $2,200,000 which is equal to more than four times all liabilities other than capital stock. The total current assets of $5,324,485 are nearly ten times the total of current liabilities, which were $549,968.

L. A. Young Earnings Off

CHICAGO, July 15—A net profit after interest and taxes of $1,080,654 is reported by the L. A. Young Spring & Wire Corp. for the six months ended June 30. This figure compares with $1,524,325 in the first half of 1929 and $1,063,898 in the same period in 1928.

The earnings quoted are equal to $2.62 a share for the 1930 period against $3.69 for the 1929 and $2.58 for the 1928 half years. For the quarter ended June 30, net profit was $563,769 after charges and Federal taxes, or $1.37 a share, against $848,678 or $2.05 for the previous June quarter.

Farm Power Survey Ready Late in Year

WASHINGTON, July 17—Final returns in connection with the survey of mechanical power on farms by the Department of Agriculture probably will not be available until late in the year. The last state survey will be made in Virginia where field work will begin in the fall.

Field studies were started last fall, covering the Middle West and some Southern States. Farmers were asked to fill out extensive questionnaires dealing with the costs and use of mechanical power, including motor trucks. Statisticians are now analyzing the report, but final results will not be announced until the Virginia survey is completed.

The study is of a cooperative character undertaken under the auspices of the Bureau of Agricultural Economics, the Bureau of Animal Industry, and the Bureau of Public Roads, all divisions of the Department of Agriculture.

Chromite Shipments Gain

WASHINGTON, July 15—Commercial shipments of domestic chromite in 1929, according to the United States Bureau of Mines, Department of Commerce, totaled 180 long tons, compared with 660 tons, in 1928. These shipments in 1929 were all from California.

The imports of chromite into the United States in 1929 established a new record for all time and amounted to 317,630 long tons, compared with 216,592 tons in 1928, and 222,360 tons in 1927, the previous record year.

Clegg Appoints Armstrong

CHICAGO, July 17—C. H. Armstrong has been appointed general manager of the Clegg Lock Washer Co., Chicago.

General Motors Sales Below the May Figure

Shipments to Consumers Pass Those To Dealers For Third Month

NEW YORK, July 18—For the third month this year, sales of General Motors cars to consumers exceeded sales to dealers. During June there were 97,318 General Motors cars delivered to consumers, as compared with 87,595 cars delivered by manufacturing divisions to dealers in the United States, according to announcement made today by Alfred P. Sloan, Jr., president.

This compares with sales to consumers in May of 131,817 and sales to dealers of 136,169, and with sales to consumers in June of last year of 154,437 and sales to dealers in June of last year of 163,704. Total sales to dealers, including Canadian sales and overseas shipments, amounted to 97,440 cars, as compared with 147,483 cars in May and with 200,754 in June of last year.

Other months during this year in which sales to consumers have exceeded sales to dealers are April with 142,004 cars sold to consumers, as against 132,365 to dealers, and March with 123,781 sold to consumers, as against 118,081 to dealers.

While no comment is made on this fact in the public announcement made by Mr. Sloan, the fact that sales to consumers are thus keeping pace with sales to dealers is clearly indicative of the policy adopted at the beginning of this year of gaging production to sales. A contributing factor, however, which must be considered at present is that Buick, and possibly other units, are allowing dealers at present to clear the board preparatory to new models to be brought out soon.

Comparative figures follow:

Sales to Consumers

	1930	1929
Jan.	74,167	73,989
Feb.	88,742	110,148
Mar.	123,781	166,942
Apr.	142,004	173,201
May	131,817	169,034
June	97,318	154,437
Six months total	657,829	847,751

Sales to Dealers

	1930	1929
Jan.	94,458	95,441
Feb.	110,904	141,222
Mar.	118,081	176,510
Apr.	132,365	176,634
May	136,169	175,873
June	87,595	163,704
Six months total	679,572	929,384

Total Sales to Dealers, Including Canadian Sales and Overseas Shipments

	1930	1929
Jan.	106,509	127,580
Feb.	126,196	175,148
Mar.	135,930	220,391
Apr.	150,661	227,718
May	147,483	220,277
June	97,440	200,754
Six months total	764,219	1,171,868

Eaton Reports Earnings

CHICAGO, July 15—Eaton Axle & Spring Co., including the Wilcox Rich Corp., reports for the six months ended June 30, a consolidated net profit of $1,385,630 after interest, depreciation and Federal taxes.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

NEW YORK, July 16—The abnormally high temperature in the West and the South last week stimulated the sales of summer goods to some extent, but, nevertheless, retail trade throughout the country was dull. Jobbing and wholesale lines continued to lag. Wage-cutting was on a much larger scale last month, and several strikes have been reported. Two principal mail order houses have recently issued catalogues, with prices the lowest in 10 years.

CHAIN STORE SALES

Sales of 47 store chains in June amounted to $235,424,558, as compared with $242,008,758 a year ago. Although this report reflects the general reduction in retail trade, some of the decline was due to the fact that there were only four Saturdays in last month, while there were five in June, 1929.

COMMERCIAL FAILURES

Commercial failures last month, according to R. G. Dun & Co., numbered 2026, which, although the lowest this year, marks the only time that failures in June surpassed the 2000 level. The liabilities involved in the June failures were the highest so far this year.

DEPARTMENT STORE SALES

Department store sales during June, according to a preliminary report of the Federal Reserve system, were 9 per cent. below those a year ago, while sales during the first half of this year were 4 per cent. below those in the corresponding period last year.

CAR LOADINGS

Railway freight loadings for the week ended June 28 totaled 936,848 cars, which marks a decline of 159,721 cars below those a year ago and a decline of 66,851 below those two years ago.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended July 12 stood at 84.5, as against 85.6 the week before and 85.7 two weeks before.

BANK DEBITS

Bank debits to individual accounts outside of New York City for the week ended July 9 were 14 per cent. below those a year ago.

FEDERAL RESERVE STATEMENT

The consolidated statement of the Federal Reserve banks for the week ended July 9 showed decreases of $24,000,000 in holdings of discounted bills, of $8,000,000 in holdings of bills bought in the open market, and of $5,000,000 in holdings of Government securities. The reserve ratio on July 9 was 81.7 per cent. as against 80.7 per cent. a week earlier and 83.7 per cent. two weeks earlier.

To Sell Tires on Deferred Payments

OAKLAND, CALIF., July 15—The Coast Tire & Rubber Co., Oakland, hereafter will sell its product, Coast tires, on time payments, it is announced by Lewis S. Budo, head of the concern. The tires may be paid for in 12 equal payments, it is stated.

Rubber Use Nears Record

NEW YORK, July 14—Crude rubber consumption for the first six months of the current year was the highest on record with the exception of 1929, according to the Rubber Manufacturers Association. Consumption during these months was 216,182 long tons and in June was 34,463 long tons as compared with 39,902 long tons in May and 43,228 long tons in June of last year.

Domestic stocks of crude rubber on hand and in transit on June 30 are estimated at 151,485 tons as compared with 146,179 long tons on May 31 and with 92,062 long tons on June 30, 1929.

Wisconsin Sales Drop

MILWAUKEE, July 14—Passenger car sales in the State of Wisconsin in June were slightly less than one-half of the sales in the same month of 1929, according to preliminary but official figures issued by the registration division of the secretary of state's office at Madison today. The number of new car registrations this year in June was 6782, compared with 13,656 a year ago. For the first six months of the year, new car registrations are 20 per cent below 1929, the total of 48,658 being comparable with 61,049 in the first half of last year.

G. M. Forms New Unit

DOVER, DEL., July 14—Incorporation of the General Motors Fleet Sales Corp., with a capital stock of 100 shares of $100 par value, was certified here today by the Secretary of State of Delaware. The new company is authorized to deal in automobile trucks, accessories, etc. Delaware agent is the Corporation Trust Co., Wilmington.

DETROIT, July 15—No statement could be elicited from General Motors officials here regarding the formation of the General Motors Fleet Sales Corp.

Bellanca Sells Tandem Plane to Chicago Paper

New Type Combines Tractor and Pusher Principles

CHICAGO, July 14—A tandem-engined cabin plane has been built recently at the plant of the Bellanca Aircraft Corp. for the *Chicago Daily News* and will shortly be put to certain tests by pilot Shirley J. Short. It is known as the Blue Streak and is powered by two Curtiss Conqueror water-cooled engines.

The engines are set back-to-back, the forward engine carrying a 13 ft. two-bladed wood propeller, while the rear engine drives a three-bladed metal propeller 9 ft. in dia. A shaft from the second engine extends through the cabin and carries the pusher-type propeller at the rear of the cabin. Thus the principles of the tractor and the pusher type are combined in this plane.

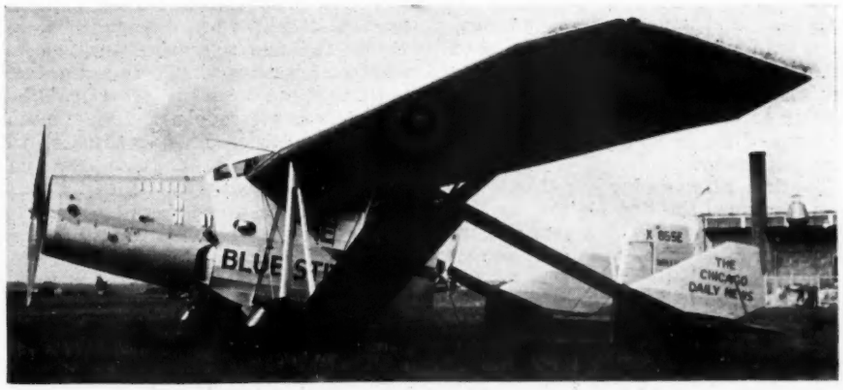
The machine was designed specially to eliminate accidents due to engine failure. Not only is it possible for the assistant pilot or mechanic to get at the engines while in flight to make minor repairs, but the plane can be flown on either of the engines alone. Following are a few of the specifications of the ship:

Wing spread of main monoplane wings, 83.2 ft.; total wing area, 912 sq. ft.; overall length, 47 ft., 3 in.; overall height, 13 ft.; fuselage or cabin length, 25 ft.; fuselage height, 10 ft., 4 in.; chord of main wings, 9 ft.; span of horizontal tail plane, 25 ft., 7 in.; weight, empty, 8000 lb.; speed on both engines, full throttle, 160 m.p.h.; speed on both engines, two-thirds throttle, 132.5 m.p.h.; gasoline capacity, 2150 gal.; speed on rear engine alone, full throttle, 114 m.p.h.; speed on forward engine alone, full throttle, 116 m.p.h.

The above performance figures are based on preliminary tests with a total of 15,500 lb. With this load the ship climbed at the rate of 1500 ft. p. m. Tests with a full load of 25,000 lb. are to be made in Chicago shortly.

Auto Craft Leases Plant

CHICAGO, July 14—The recently organized Auto Craft Radio Co., manufacturers of radios for automobiles, airplanes and boats, has leased the building at the northwest corner of Twenty-eighth Street and South Michigan Avenue where they will construct their product.



The New Bellanca "Tandem" Airplane

Auburn Earnings Gain During Second Quarter

Balance Sheet in Strongest Position for Company

AUBURN, IND., July 14 — Auburn Automobile Co., and subsidiaries, for three months ending May 31, 1930, earned consolidated net profits amounting to $769,385, equal to $4.25 per share, on the 180,882 shares of stock outstanding at this date, as compared to the consolidated net profits of $96,623 in the first quarter, equal to 53 cents per share on an equivalent basis of capitalization. In the corresponding second period of 1929 consolidated net profits were $1,312,934, or $7.26 per share, on the basis of the same number of shares outstanding.

The increased profits of the company for the second period of the fiscal year were attributed by E. L. Cord, president, to increased sales of the companies' products, and to reduced general overhead. At the same time he pointed out that the management is very conservative in its expectations for the automobile business during the second half of this year, but that Auburn is planning for the largest production in its history in 1931.

Consolidated balance sheet as of May 31, 1930, reflects the strongest position of any reporting period in the company's history, with current assets amounting to $14,733,822 (of which $4,831,209 was in cash) and current liabilities of only $4,473,153, or net quick assets of $56.17 per share on stock outstanding. Inventories have been reduced approximately $2,000,000 since the close of the last fiscal period ending Nov. 30, 1929.

Plans Battery Production

NASHVILLE, July 14—The Southern Battery Co., Milton Frank, owner, is soon to start manufacturing a complete line of general utility batteries in a modern daylight factory at 211 Shelby Avenue, Nashville, Tenn. Batteries for all make automobiles, radio and farm lighting plants will be manufactured. When all equipment planned is installed, the plant will use about 200 employees.

Buick to Have New Line

FLINT, MICH., July 15 — E. T. Strong, president and general manager of the Buick Motor Co., announced today that a complete line of eight-cylinder Buick automobiles will be introduced July 26. Mr. Strong declined to comment further other than to say that the new cars are the culmination of some three years of engineering tests by Buick and General Motors. Details as to models and prices will be announced in a few days, he said. Rumors that Buick was preparing to introduce an eight have been current in the industry for many months, but the statement today is the first official confirmation by the company's chief executive.

Consolidated Approves Merger

NEW YORK, July 14—Consolidated Instrument Co., at a stockholders' meeting last week, approved the offer of the Bendix Aviation Co. to take over the former company's assets on the basis of exchange of stock.

Blair Increases Stock

CHICAGO, July 14—The Blair Tractor Co. has increased its capital stock from 4000 shares to 10,000 shares, no par value stock, it was announced recently.

Graham in Washington on an Informal Mission

Heads N.A.C.C. Group, Tariff Discussed Informally

WASHINGTON, July 14—Robert M. Graham, who succeeded John N. Willys as chairman of the export trade committee of the National Automobile Chamber of Commerce, accompanied by other prominent men in the automobile industry, was in Washington on Thursday of last week and formally met a number of government officials with whom he will be in contact by reason of his new position.

Others in the delegation were H. H. Rice, chairman of the legislative committee; George Bauer, secretary of the export committee, and Pyke Johnson, secretary of the chamber. The visit was made entirely for the purpose of acquainting Mr. Graham with the government officials and had no relation to formal discussion of the tariff.

Informal statements made indicated that the automotive industry is expecting a decline of about 25 per cent in automobile exports in 1930 when compared with last year due to generally depressed conditions throughout the world. It was declared that the industry is not alarmed over changes made in tariff rates on automobiles in some countries.

It was also stated that the changes are not considered to be retaliatory in character but rather reflect emphasized efforts on the part of these countries to become self-contained.

A hopeful view was taken of the future, with an increase in business becoming distinctly felt.

Gould Battery Co. Sold

BUFFALO, July 12—The Gould Storage Battery Co., Depew, founded 30 years ago, has been sold by the Gould Coupler Co. to the National Battery Co., St. Paul, Minn.

Sale involves the purchase of the capital stock of $250,000 of $100 par value stock of Gould Battery, which was owned entirely by Gould Coupler. Control of Gould Battery will pass to National Battery on or about Aug. 1.

Employing about 400 men at its full capacity of 1000 batteries per day, the Depew plant will be enlarged to a capacity of approximately 4000 batteries per day and will eventually employ more than double the present number of men, it was unofficially announced.

Nachman Earnings Off

CHICAGO, July 12—The report of the Nachman Springfilled Corp. for the fiscal year which ended about the middle of June will show a profit of approximately $10,000 after all charges and federal taxes, which is equal to about $1 a share on 101,500 shares of no par value capital stock. For the year ended June 15, 1929, the company's net income was $394,035, or $3.88 a share.

German Automobile Manufacturers Willing to Drop Fine Tolerance Standard for Automotive Screw Threads

BERLIN, July 3—A questionnaire sent to German automobile manufacturers by their Standards Committee revealed that 92 per cent of them were satisfied to have the fine tolerance standard for screw threads dropped from automobile standards. The remaining firms were not directly opposed to the introduction of the medium tolerance standard for automobile practice and admitted that in most of their work they get along well with screws made according to it, but held that in about 10 per cent of the cases the fine tolerances were necessary.

One firm, after an investigation of its own, discarded the fine for the medium tolerances, for screws, but retained the fine tolerances for nuts or female threads, as with the use of taps with ground threads it is comparatively easy to maintain the fine tolerances.

One automobile manufacturer explained his adoption of the medium tolerances as follows: Originally it was thought that fine tolerances would have to be used as long as measurement of threaded bolts on the passing side was made with ring-type thread gages and the reject measurement was replaced by the trained "feel" of the inspector. But when, later on, through the introduction of caliper-type thread limit gages, reject measurements also were made, it was found that when the gages were set for the fine tolerances the rejects were too numerous, and investigation showd that the screws rejected could be used without trouble. The thread caliper gages were then readjusted to medium tolerances, and so far no troubles due to imperfect fit of threads have occurred.

It is therefore planned to cancel the fine thread tolerances for automobile work and to recommend the medium tolerances. For studs the thread at the fixed end should be held to fine tolerances, however, and for certain other threaded parts the fine tolerance also is preferable, but this is to be left to the individual manufacturer.

Motor Truck Competition is Railroad's Own Problem, I.C.C. Decision Indicates

WASHINGTON, July 17—It is not within the province or power of the Interstate Commerce Commission, or in the interest of the public, to fix rail rates unduly low for short hauls largely for the purpose of eliminating motor truck competition.

The commission recognized and stated this principle in the course of its decision handed down last week in connection with the so-called Western Trunk Line Class rate case. It pointed out that under present conditions, motor truck competition is primarily the railroads' problem and that the railroads apparently so regard it.

The commission declared that common carriers by motor truck are firmly established as a transportation need.

"There is so wide a difference between the inherent nature of the services offered by motor trucks and railroads that in many situations no conceivable rail rate could be so low as to attract an appreciable volume of less-carload business adapted to movement by motor trucks," said the commission. "Truck operators have heretofore generally adopted substantially the rail basis of rates for their charges, and there is no indication that they will depart from that practice if the rail rates are increased."

The comment of the commission was based upon evidence of state commissions and shippers bearing upon motor truck competition with railroads in Western Trunk Line territory.

These interests expressed fear of possible detrimental, even disastrous, effect upon the railroads' revenues of motor truck competition if the commission permitted increased rates. The commission did increase the class rates throughout the territory.

"Motor trucks are rapidly increasing in number and their routes are lengthening, especially where improved highways are available," said the commission. "In Minnesota, and probably in other states, trucks are sometimes equipped with refrigerating and heating devices for the protection of perishable ladings. Some common carriers by motor truck have established warehouses for the receipt and delivery of freight in small lots much like railroads, but for the most part they afford a satisfactory pick-up and delivery service. Their rates vary, but are usually made with relation to, or the same as, the corresponding rail rates, sometimes with the addition of a pick-up charge.

"Data are not available of the volume of tonnage moved by motor trucks but it seems to be considerable and constantly growing; and gross revenues are said to be substantial. Whether or not trucks are merely absorbing a part or all of the normal increase in less-carload traffic, or are making still deeper inroads into normal railroad class-rate tonnage, is not shown.

"The loss of less-than-carload tonnage to trucks appears to be largely confined to hauls for distances up to 75 miles, but in some instances up to 100 or 150 miles. The record does not definitely disclose to what extent the loss of this short-haul less-than-carload traffic, the expensive character of which has been discussed . . . is of actual pecuniary disadvantage to respondents," the report concludes.

Uniform Knock Rating for Gasoline Set Up

Involves Use of Single-Cylinder, Controlled Engine

NEW YORK, July 14—Research for the establishment of a uniform scale of anti-knock value for testing gasoline has been conducted for two years and has now reached a point where such a scale can be established, according to Dr. Graham Edgar, director of research for the Ethyl Gasoline Corp. and former head of the department of chemistry in the University of Virginia. This research has been conducted under a cooperative steering committee formed by the American Petroleum Institute and the Society of Automotive Engineers.

The method of testing which seems to work most satisfactorily, according to Dr. Edgar, is the use of a single-cylinder engine kept at constant temperature by the use of boiling water and at constant speed with the use of a synchronous motor. In one case this motor was equipped with a double carburetor so that a quick change could be made from the fuel to be tested to the reference fuel. The engine is also equipped with a bouncing pin and knockmeter to measure the knock intensity.

Rubber Prices Drop

NEW YORK, July 14—Crude rubber prices dropped to a new low level last week when trading was done at 10.8 cents, according to the F. R. Henderson Corp.

Dispatches from Europe and from the producing sections indicate considerable unsettlement as to just what plan will be adopted to regulate production. The Malacca Rubber Planters Association adopted resolutions last week asking the Planters Association of Malaya to seek changes in the legislation permitting wages to be reduced during such periods as at present encountered. They also adopted a resolution recommending the adoption of a scheme similar to the Stevenson Act in a modified form, provided the cooperation of the Dutch East Indies and Ceylon could be secured by similar legislation on their part.

Discussions in Europe point to a plan for restriction of production by 25 per cent and the establishing of a pivotal price of 9d.

Arrivals of crude rubber at all ports of the United States for the first 10 days of July are estimated at 8000 tons, with probable arrivals for the entire month placed at 37,500 tons.

Simplify Die-Head Chasers

WASHINGTON, July 15 — Current recommendations for the simplification of practice on die head chasers is contained in U. S. Department of Commerce Simplified Practice Recommendation R51-29 which has been just released.

Eighty-nine stock sizes in five distinct classifications are recommended for chasers for self-opening and adjustable die heads. An important corollary to this report is that right-hand threads only shall be considered for stock sizes, while left-hand threads will be special.

William A. Montgomery

ROCHESTER, N. Y., July 14—William A. Montgomery, one of the founders of the North East Electric Co., died at his home here on July 10. At the time of his death he was president of North East Appliances, Inc., a subsidiary formed following the sale of North East Electric to General Motors Corp. last year. He was 76 years old.

Mr. Montgomery was a native of Rochester and started his business career as a grocery clerk. In 1910 he organized the North East Electric Co. which grew from a small concern employing half a dozen men to one of the largest of its type in the automotive industry.

Mullins Gets 3 Contracts

SALEM, OHIO, July 14—The Mullins Mfg. Co. has received 3 additional contracts for automobile bodies in the past week. The die and tool departments will start work on these contracts within a short time.

G. F. Keyes, general sales manager, announced that the corporation will have a considerable increase in employment.

The Mullins Co. last week announced receipt of a $4,000,000 order for stampings, bodies and other automobile requirements, which will insure steady operation of the factories for at least six months.

Has Motor Boat Radio

CHICAGO, July 14—The American Bosch Magneto Corp. has announced a motor boat model radio. The set will amplify the line of house and automobile radios. It will be designed for seagoing service and firmly assembled to stand the roughest usage.

Twenty-four Enter Flying Derby

CHICAGO, July 14 — Twenty-four entries have been received by the American Girrus Engine Co. for the All-American Flying derby to start July 21. Approximately $40,000 will be divided among some of the best pilots in the country.

+ + CALENDAR + + OF COMING EVENTS

SHOWS

Detroit, All-American Air Derby, starts, July 21
New York, International Import Trade Exposition .....Aug. 4-9
Lwow, Poland, Sample Fair .....September
London, England, Olympia Show...October
Berlin, International Automobile..Nov. 6-16

CONVENTIONS

Society of Automotive Engineers, Aeronautical, Chicago .....Aug. 26-28
Fifth International Air Congress, Auspices Royal Aero Club, The Hague, Holland .....Sept. 1-6
Eastern States Exposition, Springfield, Mass. .....Sept. 14-20
National Safety Council, Annual Safety Congress, Pittsburgh....Sept. 29-Oct. 4
Sixth International Road Congress, Washington, D. C. .....Oct. 6-11
Exhibition—American Roadbuilders Association, Washington, D. C....Oct. 6-11
Society of Automotive Engineers, Production, Book-Cadillac Hotel, Detroit .....Oct. 7-8
Society of Automotive Engineers, Transportation, Pittsburgh .....Oct. 22-24
Motor and Equipment Association, Convention, Cleveland .....Nov. 10-14
N. S. P. A. Convention, Cleveland, Ohio, Nov. 17-21
First International Aerial Safety Congress, Paris, France .....Dec. 10-23

SALONS

Chicago, Drake Hotel .....Nov. 8-15
New York, Commodore Hotel..Nov. 30-Dec. 6
Paris, France .....Oct. 2-12
Prague, Czechoslovakia .....October
Paris, France, Salon (Commercial Vehicles) .....Nov. 13-23
Brussels, Belgium, Salon .....Dec. 6-17

RACES

Belgium (European Grand Prix)....July 20
Berlin, International Light Airplane Tour, starts .....July 20
Spain .....July 27
Italy (Grand Prix) .....Sept. 7
France (Grand Prix) .....Sept. 21

N. C. Sales Remain Low

RALEIGH, N. C., July 14—Sales of new automobiles in North Carolina continue to stay considerably below those of a year ago, according to the state automobile bureau. For the first six months of this calendar year sales were below those for the same period of last year by 17,827. Sales for the six months were 21,625 new cars, including trucks. New car sales for June were 3644, compared with 5894 for June of last year.

Registration of automobiles also shows considerable decrease. Total registration so far this year is 432,581, compared to 444,167 for the same period last year.

Better Chilean Roads Help Sales

WASHINGTON, July 17—It is estimated that the sale in Chile of the bulk of the 3000 automobiles and trucks, at least 95 per cent of which are of American origin, has been made as a result of the great improvement in Chilean highway facilities, according to a report received from Vice Consul C. C. McLain, Concepcion, Chile.

Stinson Exceeds 1929 Business

WAYNE, MICH., July 14—Stinson Aircraft Corp. built and sold more planes in the first six months of 1930 than during the entire year of 1929, W. A. Mara, vice-president, announced today.

Chilton Factory List Summarizes Executive Changes in Automotive Plants During Half Year

November, 1929, to May, 1930

Title of Executives	Automobiles	Commercial Vehicles	Buses	Tractors	Motorcycles	Aircraft	Engines	Industrial Equipment	Net Totals
Prest.	4	14	5	3	1	24	27	22	85
V.-Prest.	38	40	16	16	.	60	59	56	214
Sec.	7	30	4	4	.	41	38	28	111
Treas.	9	19	4	5	.	39	34	28	115
Gen. Mgr.	21	26	9	4	1	40	36	27	125
Works Mgr.	26	27	8	9	.	27	25	25	104
Supt.	39	35	8	4	.	31	31	28	128
Prod. Mgr.	13	19	6	5	.	30	20	21	91
Prod. Engr.	3	3	1	1	.	6	5	6	24
Pur. Agt.	25	41	9	5	.	41	29	29	138
Asst. Pur. Agt.	19	11	5	3	1	15	12	9	57
Service Mgr.	18	28	7	11	1	14	14	12	77
Engineer	56	40	13	11	1	46	50	35	185
Body Engr.	8	6	3	.	.	2	1	.	14
Tool Engr.	10	5	2	2	.	3	5	4	23
Tool Supt.	8	6	2	.	.	3	3	5	21
Fdy. Supt.	4	1	.	4	.	.	8	7	18
Pl. Maint. Engr.	14	7	3	.	.	3	4	2	24
Body Shop Supt.	13	11	4	1	.	3	1	2	23
Trim Shop Supt.	5	6	2	.	.	4	.	2	13
Mch. Shop Supt.	10	9	2	2	.	4	9	5	34
Paint Shop Supt.	9	6	5	1	1	5	3	5	29
Drop Fg. Supt.	3	.	.	.	.	.	1	1	5
Metallurgist	5	3	.	2	.	.	4	2	11
Sales Mgr.	64	51	13	12	1	34	49	46	200
Adv. Mgr.	24	23	7	6	1	23	24	27	98
Other Officers	222	152	43	8	1	48	66	30	381
Net Totals	616	540	164	106	9	464	472	427	2798

Changes in Companies Listed in Chilton Factory List

November, 1929, to May, 1930

Type of Company	New	Dropped	Change in Name	Change in Address	Other Changes	Totals
Automobiles	4	6	.	6	21	37
Commercial Vehicles	4	12	4	6	43	69
Buses	3	10	2	3	8	26
Tractors	2	6	1	1	20	30
Aircraft	36	31	3	29	142	241
Engines	20	14	4	15	79	132
Industrial Equipment	9	12	4	12	124	161
Net Totals	75	74	13	60	397	609

Ajax Moves Plant

CHARLOTTE, N. C., July 14—The plant of the Ajax Rubber Co., at Racine, Wis., will be moved to this city, according to announcement by officials of the Mc Claren Rubber Co. The Mc Claren Co. is owned by Ajax and the two plants will be combined here. The Racine plant is said to be valued at $3,000,000. Part of the machinery already has been brought here and placed in operation, and the remainder will be placed as rapidly as possible. About 400 men will be employed when installation is complete.

Durant Shipments Increase

LANSING, July 14—Shipments of Durant passenger cars and Rugby trucks from the Lansing factory during June showed a seven per cent increase over May shipment totals, according to announcement by R. T. Hodgkins.